THAMES RIVER BASIN

WINDHAM, CONNECTICUT

BIG POND DAM
CT 00194

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

AUGUST 1980

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
August 1980	Inspection Report	

4. TITLE AND SUBTITLE
CT - 00194

Big Pond Dam
National program for inspection of non-federal dams

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)
U.S. Army Corps of Engineers, New England Division

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

U.S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, MA 02254

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Army Corps of Engineers
New England Division
424 Trapelo Road
Waltham, MA 02254

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES
Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for inspection of non-federal dams

14. ABSTRACT
The dam, reported to have been constructed about 1870 by the Smith and Winchester Company, consists of an earth embankment with an auxiliary spillway at the right end and a principal spillway 115+/- feet from the left end of the dam. The dam has a maximum impoundmen of 300 acre-feet and is 19+/- feet in height above the streambed of Pigeon Swamp Brook at the toe of the dam. The embankment is 530 fee in length including the two spillways and is 10 feet wide at the top (elevation 261.6). The upstream slope is a concrete wall and the downstream slope is covered with trees and brush except for a 100 foot long dry-laid stone retaining wall at the toe of the dam, right of the principal spillway. The principal spillway is a 25 foot wide broad-crested masonry weir with concrete training walls upstream and dry-laid stone training walls downstream. The auxiliary spillway is a 40+/- foot wide swale at the right end of the dam with a small earth embankment dike at the left side to form the discharge channel. The low-level outlet is a stone conduit which is located at the central portion of the dam and has a sluice gate at the upstream side. The conduit is approximately 2 feet square through most of the dam but widens to an arch conduit where it outlets at the downstream stone retaining wall.

15. SUBJECT TERMS
Dams, Inspection, Dam Safety, Thames River Basin, Windham, Connecticut

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			Matthew Connell
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	95	19b. TELEPHONE NUMBER *(include area code)* 978-318-8349

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEDED-E

DEC 9 1980

Honorable Ella T. Grasso
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor Grasso:

Inclosed is a copy of the Big Pond Dam (CT-00194) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. The report is based upon a visual inspection, a review of past performance, and a preliminary hydrological analysis. A brief assessment is included at the beginning of the report.

The preliminary hydrologic analysis has indicated that the spillway capacity for the Big Pond Dam would likely be exceeded by floods greater than 15 percent of the Probable Maximum Flood (PMF), the test flood for spillway adequacy. Our screening criteria specifies that a dam of this class which does not have sufficient spillway capacity to discharge fifty percent of the PMF, should be adjudged as having a seriously inadequate spillway and the dam assessed as unsafe, non-emergency, until more detailed studies prove otherwise or corrective measures are completed.

The term "unsafe" applied to a dam because of an inadequate spillway does not indicate the same degree of emergency as that term would if applied because of structural deficiency. It does indicate, however, that a severe storm may cause overtopping and possible failure of the dam, with significant damage and potential loss of life downstream.

It is recommended that within twelve months from the date of this report the owner of the dam engage the services of a professional or consulting engineer to determine by more sophisticated methods and procedures the magnitude of the spillway deficiency. Based on this determination, appropriate remedial mitigating measures should be designed and completed within 24 months of this date of notification. In the interim a detailed emergency operation plan and warning system should be promptly developed. During periods of unusually heavy precipitation, round-the-clock surveillance should be provided.

DEC 9 1980

NEDED-E
Honorable Ella T. Grasso

I have approved the report and support the findings and recommendations described in Section 7, with qualifications as noted above. I request that you keep me informed of the actions taken to implement these recommendations since this follow-up is an important part of the non-Federal Dam Inspection Program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. This report has also been furnished to the owner of the project, H.L. Diehl Corporation, South Windham, Conn.

Copies of this report will be made available to the public, upon request to this office, under the Freedom of Information Act, thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for the cooperation extended in carrying out this program.

Sincerely,

WILLIAM E. HODGSON, JR.
Colonel, Corps of Engineers
Acting Division Engineer

THAMES RIVER BASIN

WINDHAM, CONNECTICUT

BIG POND DAM
CT 00194

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

AUGUST 1980

BRIEF ASSESSMENT

PHASE I INSPECTION REPORT

NATIONAL PROGRAM OF INSPECTION OF DAMS

Name of Dam:	BIG POND DAM
Inventory Number:	CT 00194
State Located:	CONNECTICUT
County Located:	WINDHAM
Town Located:	SOUTH WINDHAM
Stream:	PIGEON SWAMP BROOK
Owner:	H.L. DIEHL COMPANY INC.
Date of Inspection:	APRIL 2, 1980
Inspection Team:	PETER M. HEYNEN, P.E.
	MIRON PETROVSKY
	MURALI ATLURU, P.E.
	JAY A. COSTELLO

The dam, reported to have been constructed about 1870 by the Smith and Winchester Company, consists of an earth embankment with an auxiliary spillway at the right end and a principal spillway 115± feet from the left end of the dam. The dam has a maximum impoundment of 300 acre-feet and is 19± feet in height above the streambed of Pigeon Swamp Brook at the toe of the dam. The embankment is 530 feet in length including the two spillways and is 10 feet wide at the top (elevation 261.6). The upstream slope is a concrete wall and the downstream slope is covered with trees and brush except for a 100 foot long dry-laid stone retaining wall at the toe of the dam, right of the principal spillway. The principal spillway is a 25 foot wide broad-crested masonry weir with concrete training walls upstream and dry-laid stone training walls downstream. The auxiliary spillway is a 40± foot wide swale at the right end of the dam with a small earth embankment dike at the left side to form the discharge channel. The low-level outlet is a stone conduit which is located at the central portion of the dam and has a sluice gate at the upstream side. The conduit is approximately 2 feet square through most of the dam but widens to an arch conduit where it outlets at the downstream stone retaining wall.

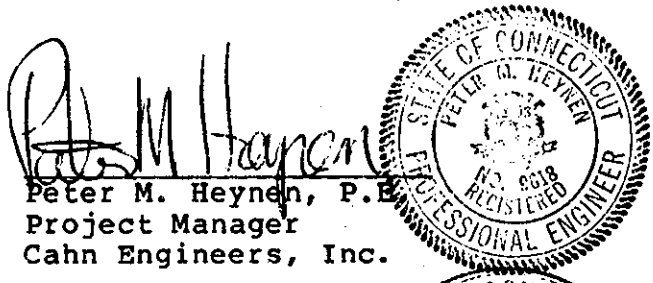
Based upon the visual inspection at the site and past performance, the dam appears to be in poor condition. Excessive seepage through the embankment and the poor condition of the upstream concrete walls, downstream stone retaining wall and outlet works indicate that stability problems may develop in the future.

In accordance with the Corps of Engineers' guidelines, Big Pond Dam is classified as a high hazard, small size dam. The test flood range to be considered is from one-half the Probable Maximum Flood (½ PMF) to the Probable Maximum Flood (PMF). The test flood for Big

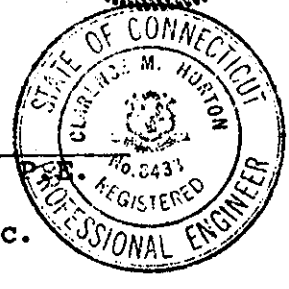
Pond Dam has been selected as equivalent to the PMF. Peak inflow to the pond at the test flood is 3250 cfs and peak outflow is 2980 cfs with the dam overtopped 1.0 feet. The spillway capacities with the level of the pond to the top of the dam are 510 cfs at the principal spillway and 380 cfs at the auxiliary spillway, which is 17% and 13% of the routed test flood outflow, respectively. The total spillway capacity is 890 cfs, which is 30% of the routed test flood outflow.

It is recommended that the owner retain the services of a registered professional engineer to analyze in more detail the adequacy of the existing outlet facilities and overtopping potential. Other items of importance include implementation of a program for under water inspection of the outlet conduit, sluice gate and concrete wall at the upstream slope. Also, implementation of a program for geotechnical investigation to determine the condition of the embankment and to analyze the safety of the project. Further inspection of the project is recommended to determine the origin and significance of seepage at the toe of the dam. Recommendations should be made by the engineer and implemented by the owner.

It is recommended that all seepage be investigated immediately upon the owner's receipt of this report. Other recommendations and further remedial measures which are discussed above and in Section 7, should be instituted within 1 (one) year of the owner's receipt of this report.



Peter M. Heynen, P.E.
Project Manager
Cahn Engineers, Inc.



C. Michael Horton, P.E.
Department Head
Cahn Engineers, Inc.

This Phase I Inspection Report on BIG POND DAM (CT-00194) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

RICHARD DIBUONO, CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRIAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspection. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam would necessarily represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions there of. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as neccessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

The information contained in this report is based on the limited investigation described above and is not warranted to indicate the actual condition of the dam. The integrity of the dam can only be determined by a means of a monitoring program and/or a detailed physical investigation. The accuracy of available data is assumed where not in obvious conflict with facts observable during the visual inspection.

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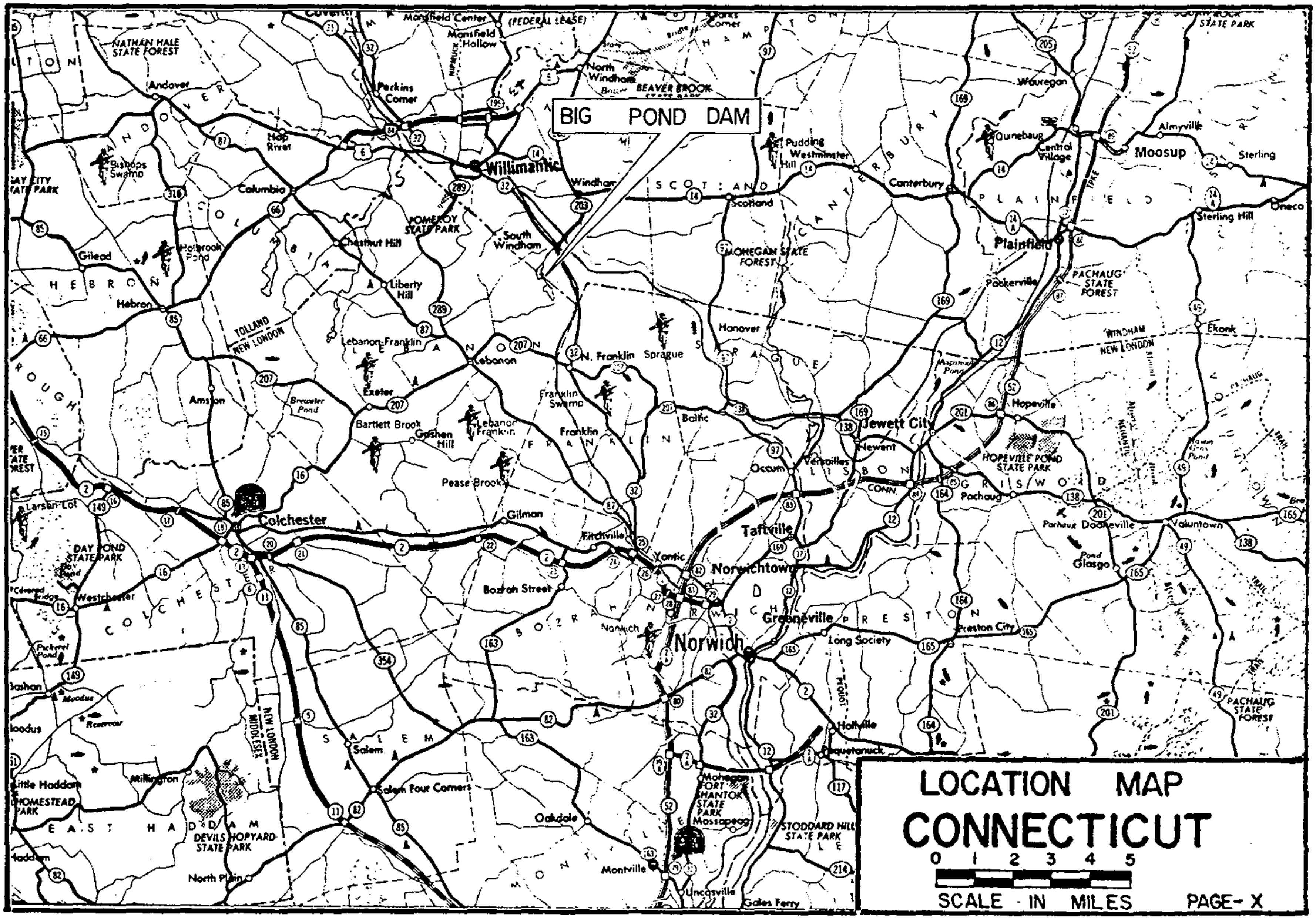
SECTION 7: ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

APPENDICES

OVERVIEW PHOTO
(February, 1980)

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	NATIONAL PROGRAM OF	Big Pond Dam	South Windham	DATE Aug. 1980
CAHN ENGINEERS INC. WALLINGFORD, CONN. ENGINEER	INSPECTION OF NON-FED DAMS	Pigeon Swamp Brook	CONNECTICUT	CE # 27 785 KD PAGE ix


BIG POND DAM
LOCATION MAP
CONNECTICUT
0 1 2 3 4 5
SCALE IN MILES
PAGE- X
Willimantic
Norwich
Colchester
Jewett City
Moosup
Plainfield
Norwichtown
Taftville
Greeneville
Andover
Columbia
Hebron
Gilead
Amston
Lebanon
N. Franklin
Sprague
Baltic
Hanover
Scotland
Canterbury
Windham
South Windham
North Windham
Perkins Corner
Mansfield Hollow
Chestnut Hill
Liberty Hill
Exeter
Bartlett Brook
Goshen Hill
Pease Brook
Gilman
Fitchville
Yantic
Bozrah Street
Occum
Versailles
Newent
Hopeville
Pachaug
Voluntown
Sterling
Sterling Hill
Oneco
Almyville
Quinebaug
Central Village
Wauregan
Packerville
Ekonk
Doaneville
Glasgo
Preston City
Long Society
Hallville
Poquetanuck
Mohegan
Massapeag
Uncasville
Montville
Oakdale
Salem
Salem Four Corners
North Plain
Millington
Westchester
Bashan
Little Haddam
Haddam
Larsen Lot
NATHAN HALE STATE FOREST
BEAVER BROOK STATE PARK
POMEROY STATE PARK
MOHEGAN STATE FOREST
PACHAUG STATE FOREST
HOPEVILLE POND STATE PARK
DAY POND STATE PARK
DEVILS HOPYARD STATE PARK
FORT SHANTOK STATE PARK
STODDARD HILL STATE PARK
TOLLAND
NEW LONDON
WINDHAM
MIDDLESEX

PHASE I INSPECTION REPORT

BIG POND DAM

SECTION I - PROJECT INFORMATION

1.1 GENERAL

a. Authority - Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Cahn Engineers, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed were issued to Cahn Engineers, Inc. under a letter of April 14, 1980 from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW 33-80-C-0052 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection Program - The purposes of the program are to:

1. Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interests.

2. Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dam.

3. To update, verify and complete the National Inventory of Dams.

c. Scope of Inspection Program - The scope of this Phase I inspection report includes:

1. Gathering, reviewing and presenting all available data as can be obtained from the owners, previous owners, the state and other associated parties.

2. A field inspection of the facility detailing the visual condition of the dam, embankments and appurtenant structures.

3. Computations concerning the hydraulics and hydrology of the facility and its relationship to the calculated flood through the existing spillway.

4. An assessment of the condition of the facility and corrective measures required.

It should be noted that this report passes judgement only on those factors of safety and stability which can be determined by a visual surface examination. The inspection is to identify those visually apparent features of the dam which evidence the need for corrective action and/or further study and investigation.

1.2 DESCRIPTION OF PROJECT

a. Location - The dam is located on the Pigeon Swamp Brook (Thames River Basin) in a rural area of the town of South Windham, County of Windham, State of Connecticut. The dam is shown on the Willimantic USGS Quadrangle Map having coordinates latitude N41° 40.3' and longitude W72° 10.5'.

b. Description of Dam and Appurtenances - The dam embankment is approximately 530 feet long, 19.2 feet in height and 10 feet wide at the top (elevation 261.6). The upstream slope consists of riprapped fill and a concrete wall which consists of several sections and extends the entire length of the dam except for the spillways. (See Overview Photo and Photos 1 and 2) The two newest sections of wall have been dated 1943 and are 3.5 feet in width. One of these sections extends 58 feet to the left of the principal spillway and forms the left spillway training wall. The other section extends 80 feet to the right of the principal spillway and forms the right training wall. A third section of wall is dated 1938 and forms the left training wall for the auxiliary spillway. This wall is 3 feet wide and extends from the auxiliary spillway to the newer section of wall (see sheet B-1). Approximately 6 feet below the top of the concrete walls, riprap has been placed at a 2 horizontal to 1 vertical slope to from the remainder of the upstream slope below the waterline. The downstream slope has a dry-laid stone retaining wall which ranges in height from 1.5 feet at the principal spillway to 7 feet at the outlet conduit. (Photo 4) This wall extends 100 feet right from the right end of the principal spillway. The downstream slope is inclined at 2.5 horizontal to 1 vertical except above the stone retaining wall where it is approximately 2 horizontal to 1 vertical. This slope is covered with trees and thick brush.

The principal spillway is a 25 foot long, broad-crest, stone masonry weir. The spillway crest is at elevation 258.0, which is 2.8 feet below the top of the spillway training walls and 3.6 feet below the top of the dam. The auxiliary spillway is a 40± foot long grass covered swale with a minimum elevation of 259.1 at the center. A small earth dike extend 70± feet along the left side of the auxiliary spillway perpendicular to the dam. This dike forms the auxiliary spillway discharge channel (see sheet B-1). The discharge channel has hand-laid riprap along the floor and is overgrown with weeds and brush.

The outlet is a sluice gate of unknown construction and dimensions located 75 feet to the right of the principal spillway at the upstream side of the dam. This sluice gate opens to a 2 foot by 2 foot (approximate) stone conduit which expands to a 4 foot high by 3 foot wide stone arch conduit at the outlet. The invert of the arch conduit is 242.4 at the downstream end and the upstream invert is unknown. The mechanism for lowering and raising the sluice gate has fallen to disrepair and is inoperable.

c. Size Classification - (SMALL) - The dam impounds approximately 300 acre-feet of water with the pond level to the top of the dam, which at elevation 261.6 is 19.2 feet above the streambed at the toe of the dam. According to the Army Corps of Engineers' "Recommended Guidelines", a dam with this height and available storage capacity is classified as small in size.

d. Hazard Classification - HIGH - If the dam were breached, there is potential for loss of more than a few lives and extensive property damage at an industrial area, as well as a residential area, of South Windham just above Route 32. The initial impact area is an industrial complex approximately 2300 feet downstream from the dam. In this area, several buildings including a factory, offices and warehouse are located 4± feet above the streambed, with one of the warehouses directly above the stream. Further downstream and 3000± feet from the dam, there are at least 4 houses located 4± feet above the streambed. Route 32 and Babcock Hill Road would also be impacted upon failure of Big Pond Dam. (See Sheet D-1)

e. Ownership - H. L. Diehl Corporation
Machine Shop Road
South Windham, Conn. 06266
Mr. H. L. Diehl (203) 423-7741

The dam was originally built and owned by the Smith and Winchester Company of South Windham, Connecticut. Around 1954, the Camaron Machine Company purchased the Smith and Winchester building and acquired the dam with the property. In 1969, the property was purchased by the present owner, the H. L. Diehl Corporation.

f. Operator - Owner (see ownership, above)

g. Purpose of Dam - Recreation - The dam was originally built to supply water to the Smith and Winchester Company and to supply water for fire fighting in South Windham. The dam is now used solely for recreational activities.

h. Design and Construction History - The following information is believed to be accurate based on the correspondence available and conversations with a representative of the owner. The dam was built in the 1870's by the Smith and Winchester Company. The dam was raised in 1938 and a concrete wall added on the upstream slope. New sections of concrete wall were added or part of the old one was replaced in 1943. These new sections of wall extend to either side of the spillway and also form the spillway walls.

i. Normal Operational Procedures - No formal program of operation is known to exist.

1.3 PERTINENT DATA

a. Drainage Area - 2.2 square miles of undeveloped, rolling to flat terrain which includes Spencer Pond and a large swamp at the central portion of the drainage area. The drainage area for Spencer Pond is 0.23 square miles.

b. Discharge at Damsite - Discharge is over the principal spillway, the auxiliary spillway and through the low-level conduit outlet.

1. Outlet Works:	
2 by 2 foot square stone conduit @ d/s invert el. 242.4:	85 cfs (water level to top of dam)
2. Maximum known flood at damsite:	1.7 below top of dam as reported by owner representative. Estimated to be 270 cfs.
3. Ungated principal spillway capacity @ top of dam el. 261.6:	510 cfs.
4. Ungated auxiliary spillway capacity @ top of dam el. 261.6:	380 cfs
5. Ungated principal spillway capacity @ test flood el. 262.6:	740 cfs
6. Ungated auxiliary spillway capacity @ test flood el. 262.6:	660 cfs
7. Total spillway capacity @ top of dam el. 261.6:	890 cfs
8. Total spillway capacity @ test flood elevation 262.6:	1400 cfs
9. Total project discharge @ test flood el. 262.6:	3000 cfs

c. Elevations (National Geodetic Vertical Datum based on assumed spillway elevation. See sheet B-1).

1. Streambed at toe of dam:	242.4
2. Maximum tailwater:	Unknown
3. Upstream portal invert diversion tunnel:	N/A
4. Normal pool:	258.0
5. Full flood control pool:	N/A
6. Spillway crest (ungated):	258.0
7. Design surcharge:	unknown
8. Top of dam:	261.6
9. Test flood surcharge:	262.6

d. Reservoir (Length in feet)

1. Normal pool:	2200 ft.
2. Flood control pool:	N/A
3. Spillway crest pool:	2200 ft.
4. Top of dam:	2500 ft.
5. Test flood pool:	2600 ft.

e. Storage (acre-feet)

1. Normal pool:	165 acre-ft.
2. Flood control pool:	N/A acre-ft.
3. Spillway crest pool:	165 acre-ft.
4. Top of dam:	300 acre-ft.
5. Test flood pool:	340 acre-ft.

f. Reservoir Surface (acres)

1. Normal pool:	32 acres
2. Flood control pool:	N/A
3. Spillway crest:	32 acres
4. Top of dam:	44 acres
5. Test flood pool:	46 acres

g. Dam

1. Type:	Earth embankment
2. Length:	530 ft.
3. Height:	19.2 ft.
4. Top width:	10 ft.
5. Side slopes:	vertical (Upstream) 2.5H to 1.0 V(Downstream)
6. Zoning:	Unknown
7. Impervious Core:	Unknown
8. Cutoff:	N/A

9.	Grout curtain:	N/A
10.	Other:	Concrete walls on upstream slope. Dry-laid stone retaining wall at downstream slope

h. Diversion and Regulatory Tunnel - N/A

i. Spillways

Principle Spillway

1.	Type:	Broad-crested masonry weir
2.	Length of weir:	25 ft.
3.	Crest elevation:	258.0
4.	Gates:	N/A
5.	U/S Channel:	Gravel fill
6.	D/S Channel:	7 foot drop to natural streambed, boulders
7.	General:	3 foot concrete training walls

Auxiliary Spillway

1.	Type:	Unlined swale to riprap lined channel
2.	Length of weir:	40 feet
3.	Crest elevation:	259.1
4.	Gates:	N/A
5.	U/S Channel:	Gently sloped, lake bottom
6.	D/S Channel:	Riprap lined channel to streambed
7.	Other:	Earth dike along left side of channel to prevent flow to toe of dam

j. Regulating Outlets - The only regulating outlet is the 2' by 2' low-level stone conduit at center of dam.

1. Invert:	242.4 (d/s)
2. Size:	2' by 2'
3. Description:	square dry-laid stone conduit at center of dam.
4. Control Mechanism:	Hand operated sluice gate at upstream side of dam
5. Other:	low level conduit expands to a 4' high by 3' wide arch conduit at d/s side of dam

SECTION 2: ENGINEERING DATA

2.1 DESIGN DATA

The available data consists only of correspondence obtained from the State of Connecticut Department of Environmental Protection. This correspondence concerns inspections by the State of Connecticut and recommendations made to the owner to repair or remove the dam. The correspondence available indicates the design features stated previously herein. There are no engineering values, assumptions, test results or calculations available for the original construction, subsequent raising in 1938 or construction of concrete walls on the upstream slope in 1938 and 1943.

2.2 CONSTRUCTION DATA

No information is available.

2.3 OPERATION DATA

Lake level readings are not taken at any specific intervals. According to the owner, the dam spillway capacities have never been exceeded. No formal operation records are known to exist.

2.4 EVALUATION OF DATA

a. Availability - Existing data was provided by the State of Connecticut Department of Environmental Protection. The owner made the project available for visual inspection.

b. Adequacy - The limited amount of detailed engineering data available was generally inadequate to perform an in-depth assessment of the dam, therefore, the assessment of this dam must be based on visual inspection, performance history, hydraulic computations of spillway capacity and approximate hydrologic judgements.

c. Validity - A comparison of record data and visual observations reveals no significant discrepancies in the record data.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General - Based upon the visual inspection performed on April 2, 1980, the general condition of the dam is poor. Inspection revealed areas requiring repair, maintenance and monitoring. The reservoir level was 258.2 with water flowing over the principal spillway at the time of the initial inspection. A subsequent inspection on July 18, 1980 revealed no changes in the condition of the dam. There was no flow over the spillway at the second inspection with the water level at elevation 256.7.

b. Dam

Crest - The crest of the dam is covered with grass, weeds and brush and is very uneven. An area eroded by trespassing was noted on the downstream side of the crest and directly above the outlet conduit. (See photo 4)

Upstream Slope - The upstream slope is the vertical face of several sections of concrete wall and a small riprapped section at the left end of the dam (Photos 1 and 2). The older section of concrete wall at the right end of the dam is severely spalled and deteriorated, with large cracks and exposed aggregate (Photo 2). The slope at the left end of the embankment has some missing riprap and exposed areas. The newer section of wall appears to be in good condition (Photo 1). The top of the concrete walls are 2-3 feet below the top of dam. The riprapped slope below the waterline could not be inspected.

Downstream Slope - The downstream slope is covered with large trees and brush. The alignment of the dry-laid stone retaining wall at the center of the dam appears good, but the wall needs repair and there are some trees and brush growing out between the stones (Photo 4). Three seeps of 2-5 gpm were observed at the central portion and right end of the toe of the embankment (Photo 6). Several more large seeps were noted at the toe of the slope near the outlet conduit and at the left end of the dam (See sheet B-1). The water emanating from all seeps was clear at the time of the inspections.

Principal Spillway - This spillway is in poor condition. There is undermining of the concrete training walls as well as some cracking of the concrete (Photos 7 and 9). The riprap protection on the approach channel and crest of the spillway has been removed (Photo 7). The dry-laid stone training walls at the downstream side of the spillway have brush and small trees growing between the stones, displacing some of the stone. The discharge channel has several large holes in the stone paving and is overgrown with trees and brush (Photo 8). There was seepage emanating from under the stone paving although there was no water flowing over the spillway during the July, 1980 inspection (Photo 10).

Auxiliary Spillway - The weir for this spillway is a low swale with a grass and weed cover. The small earth dike at the left side of the spillway channel has a grass cover and brush on the slopes. The hand-laid riprap on the floor of the spillway channel is overgrown with brush and small trees. There are no training walls for this spillway except for a small section of concrete at the left end of the spillway. This concrete is severely spalled and deteriorated (Photo 2).

c. Appurtenant Structures - The gate mechanism for the sluice gate at the upstream side of the dam is inoperable. The wooden connection to the sluice gate is rotted and broken at the waterline, leaving the gate in a closed position (see sketch page B-9). The 2 foot square conduit through the dam appears to be in good condition with a wet area on the right wall. Water was flowing through conduit at time of inspection (Photo 5). The outlet headwall is the stone wall at the downstream slope. This wall is in fair condition (Photo 4). The sluice gate could not be seen at the time of the inspection and is assumed to be 2 feet by 2 feet in size.

d. Reservoir Area - The area surrounding the pond is wooded and undeveloped.

e. Downstream channel - The downstream channel is natural streambed, wooded and undeveloped to the initial impact area. There is a small pond and dam approximately 1700 feet downstream.

3.2 EVALUATION

Based upon the visual inspection, the project is assessed as being in poor condition. The following conditions which could influence the future condition and/or stability of the dam were identified.

1. The poor condition of the concrete walls at the upstream slope.

2. The inoperable sluice gate for the low-level outlet provides no means for emergency drawdown.

3. Seepage on the downstream slope and toe of the embankment.

4. The condition of the stone retaining wall on the downstream slope.

5. Trees and brush on the slopes and crest of the embankment and in the spillways.

6. Erosion area caused by trespassing on the crest and downstream slope of the embankment directly above the outlet conduit.

7. The poor condition of the principal spillway and seepage through or under the downstream face of the spillway.

SECTION 4: OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 OPERATIONAL PROCEDURES

a. General - There are no formal procedures for regulation of flows or pond levels. There is no operator at the dam, nor has anyone been assigned responsibility for operational procedures. The only gated outlet is the low-level conduit at the center of the dam.

b. Description of Any Formal Warning System in Effect - No formal warning system is in effect.

4.2 MAINTENANCE PROCEDURES

a. General - There is no formal program for maintenance of the dam in existence. The owner reports that trees and brush were cut in the early 1970's, but there is no standard procedure.

b. Operating Facilities - No formal program for maintenance of operating facilities is known to exist.

4.3 EVALUATION

The operation and maintenance procedures are poor. A formal program of operation and maintenance procedures should be implemented by the owner, including documentation to provide complete records for future reference. Also, a formal warning system should be developed and implemented within the time period indicated in Section 7.1c. Remedial operation and maintenance recommendations are presented in Section 7.

SECTION 5: EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 GENERAL

The drainage area is 2.2 square miles of wooded, rolling to flat terrain which is located in the Thames River Basin and includes the 0.23 square mile drainage area for Spencer Pond and a large swamp at the central portion of the watershed. There is a small pond and dam approximately 1700 feet downstream from Big Pond. The dam impoundment is presently used for recreational purposes.

The maximum storage to the top of the dam (Elevation 261.6) is estimated to be 300 acre-feet. The dam is classified as a small size, high hazard dam.

5.2 DESIGN DATA

No hydraulic/hydrologic computations could be found for the original design of the dam or for the subsequent raising in 1938.

5.3 EXPERIENCE DATA

No information on serious problem situations arising at the dam or downstream reaches of the dam was found. The maximum previous discharge at the dam is estimated to be 270 cfs at 1.7 feet below the top of the dam, as observed by the owner.

5.4 TEST FLOOD ANALYSIS

Based upon the U.S. Army Corps of Engineers "Preliminary Guidance for Estimating Maximum Probable Discharges" dated March, 1978, the watershed classification (Rolling to Flat) and the watershed area of 2.2 square miles, a PMF of 3250 cfs or 1500 cfs per square mile is estimated at the damsite. The dam is classified as a small size, high hazard dam and therefore, the range of test floods to be considered is from the ½ PMF to the PMF. In view of the significant development adjacent to the brook downstream of the dam, the test flood for Big Pond Dam is considered to be equivalent to the PMF.

The peak inflow at the PMF is determined to be 3250 cfs and the peak outflow is estimated to be 2980 cfs with the dam overtopped 1.0 foot, or with a pool elevation of 262.6. The spillway capacities for the principal and auxiliary spillways with the pool to the top of the dam are 510 cfs and 380 cfs respectively. The total spillway capacity is 890 cfs, which is 30% of the routed test flood outflow.

Similarly, the dam is also evaluated for a test flood of 1/2 PMF. The peak inflow for the 1/2 PMF is 1625 cfs and the peak outflow is estimated to be 1400 cfs with the dam overtopped 0.3 feet.

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SECTION 6: EVALUATION OF STRUCTURAL STABILITY

6.1 VISUAL OBSERVATIONS

The project is an embankment dam with a concrete wall along the upstream slope and a dry-laid stone retaining wall at the downstream slope where the dam is highest. The existence of a corewall is unknown. The inspection revealed several areas which could influence the structural stability of the dam. These include seepage emanating from the toe of the dam at the right end of the embankment and seepage at the toe near the central and left sections of embankment. Also, there is severe spalling and deterioration of the concrete wall along the upstream face of the dam and deterioration of the dry-laid stone retaining wall. Seepage was observed under the lining in the spillway discharge channel although there was no flow over the spillway. Erosion, probably from trespassing, was noted on the crest of the dam directly above the outlet conduit, and the low-level sluice gate is inoperable.

6.2 DESIGN AND CONSTRUCTION DATA

There is not enough design and construction data available to permit an in-depth assessment of the structural stability of the dam.

6.3 POST CONSTRUCTION CHANGES

The dam was raised in 1938 and a concrete wall added on the upstream slope from the auxiliary spillway to the low-level outlet. In 1943, another section of wall was added. This wall abuts the older one and continues almost to the left end of the dam and forming the principal spillway training walls.

6.4 SEISMIC STABILITY

The dam is in Seismic Zone 1 and according to Recommended Guidelines, need not be evaluated for seismic stability.

SECTION 7: ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Condition - Based upon the visual inspection of the site and past performance, the project appears to be in poor condition with items which require repair, maintenance and monitoring.

Based upon the Army Corps of Engineers' "Preliminary Guidance for Estimating Maximum Probable Discharges", dated March 1978, and hydraulic/hydrologic computations, peak inflow to the pond is 3250 cfs and peak outflow is 2980 cfs with the dam overtopped 1.0 foot. With the pool level at the top of the dam, the principal spillway capacity is 510 cfs and the auxiliary spillway capacity is 380 cfs. The total spillway capacity is 890 cfs, which is equivalent to 30% of the routed test flood outflow.

b. Adequacy of Information - The information available is such that an assessment of the condition and stability of the dam must be based solely on visual inspection, past performance of the dam, and sound engineering judgement.

c. Urgency - It is recommended that all seepage be investigated immediately upon the owner's receipt of this report. The other measures presented in Section 7.2 and 7.3 should be implemented within 1 year of the owner's receipt of this report.

7.2 RECOMMENDATIONS

It is recommended that further investigation be made by a registered professional engineer qualified in dam design and inspection pertaining to the following items. Recommendations should be made by the engineer and implemented by the owner.

1. Origin and significance of all seepage sources at the principal spillway and along the toe of the embankment should be investigated immediately upon the owner's receipt of this report. A program for flow meter installation and frequency of readings should be developed.

2. A more detailed hydraulic/hydrologic analysis to determine the adequacy of the existing project discharge and overtopping potential.

3. Inspection of the low-level outlet to determine the condition of the sluice gate and the internal condition of the conduit. This inspection would probably include implementation of a diving program.

4. Boring program development to establish the condition of the embankment and dam foundation. This program should include soil sampling and piezometer installation.

5. Dam stability analysis including stability of the stone retaining wall on the downstream slope under normal and maximum reservoir elevations, and stability of the upstream concrete wall during sudden drawdown of the reservoir.

6. Repair of the low-level sluice gate and operating mechanism.

7. Repair all spalled and deteriorated concrete as well as the undermining of the principal spillway training walls.

8. Removal of large trees from the top of the dam and slopes. This should include the removal of root systems, proper backfilling and placement of slope protection.

7.3 REMEDIAL MEASURES

a. Operation and Maintenance Procedures - The following measures should be undertaken within the time period indicated in Section 7.1c, and continued on a regular basis.

1. Round-the-clock surveillance should be provided by the owner during periods of heavy precipitation and high project discharge. The owner should develop and implement an emergency action plan as well as a downstream warning system in case of emergencies at the dam.

2. A formal program of operation and maintenance procedures should be instituted and fully documented to provide accurate records for future reference. The project should be inspected by the owner or owner representative at monthly intervals.

3. A comprehensive program of inspection by a registered professional engineer qualified in dam design and inspection should be instituted on an annual basis.

4. Downstream masonry retaining wall repair.

5. Filling of erosion and grading the top of the dam.

6. Seepage rate monitoring with lake level readings as recommended by the engineer in Section 7.2. Any changes in seepage not corresponding to changes in lake level should be analyzed immediately by a qualified engineer.

7. Removal of debris from spillway discharge channel.

8. Cutting of grass, brush and small trees on the top of the dam, slopes and spillways.

7.4 ALTERNATIVES

One possible alternative to the above recommendations is to drain the pond and remove the dam.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Big Pond Dam

DATE: April 2, 1980

TIME: 1:30 PM

WEATHER: Rain, 50°F

W.S. ELEV. 258.0 U.S.

PARTY:	INITIALS:	DISCIPLINE:
1. Peter M. Heynen	PMH	Geotechnical
2. Miron Petrovsky	MP	Geotechnical
3. Murali Atluru	MA	Hydraulic/Hydrologic
4. Jay A. Costello	JAC	Geotechnical
5. Tim Kavanaugh	TK	Survey
6.		

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Embankment	PMH, JAC, MP, MA, TK	
2.	Principal Spillway	PMH, JAC, MP, MA, TK	
3.	Auxiliary Spillway	PMH, JAC, MP, MA, TK	
4.	Stone Retaining Wall	PMH, JAC, MP, MA	
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			

PERIODIC INSPECTION CHECK LIST

PROJECT Big Pond Dam DATE April 2, 1980

PROJECT FEATURE Embankment BY PMH, JAC, MP, MA, JK

AREA EVALUATED		CONDITION
DAM EMBANKMENT		
Crest Elevation		261.6
Current Pool Elevation		258.0
Maximum Impoundment to Date		unknown
Surface Cracks		none observed
Pavement Condition		N/A
Movement or Settlement of Crest		depression at center of crest above outlet conduit
Lateral Movement		none observed
Vertical Alignment		appears good
Horizontal Alignment		
Condition at Abutment and at Concrete Structures		Concrete wall at upstream slope is severely spalled and deteriorated
Indications of Movement of Structural Items on Slopes		settlement of stone retaining wall on d/s slope
Trespassing on Slopes		yes - erosion from trespassing near center of dam
Sloughing or Erosion of Slopes or Abutments		
Rock Slope Protection-Riprap Failures		left end of embankment
Unusual Movement or Cracking at or Near Toes		none observed
Unusual Embankment or Downstream Seepage		large quantities of seepage at d/s slope and toe
Piping or Boils		none observed
Foundation Drainage Features		N/A
Toe Drains		N/A
Instrumentation System		N/A

PERIODIC INSPECTION CHECK LIST

PROJECT Big Pond Dam DATE April 2, 1980

PROJECT FEATURE Principal Spillway BY PMH, JAC, MP, MA, JK

AREA EVALUATED		CONDITION
OUTLET WORKS-SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS		Broad-crested stone weir, with concrete and stone training walls
a) Approach Channel		
General Condition		good
Loose Rock Overhanging Channel		none observed
Trees Overhanging Channel		
Floor of Approach Channel		gravel fill
b) Weir and Training Walls		
General Condition of Concrete		some cracks in training walls
Rust or Staining		none observed
Spalling		
Any Visible Reinforcing		
Any Seepage of Efflorescence		
Drain Holes		
c) Discharge Channel		
General Condition		poor
Loose Rock Overhanging Channel		none
Trees Overhanging Channel		yes
Floor of Channel		boulders and wood debris
Other Obstructions		N/A

PERIODIC INSPECTION CHECK LIST

PROJECT Big Pond Dam DATE April 2, 1980

PROJECT FEATURE Auxiliary Spillway BY

AREA EVALUATED		CONDITION
OUTLET WORKS-SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS		Low swale
a) Approach Channel		
General Condition		good
Loose Rock Overhanging Channel		N/A
Trees Overhanging Channel		
Floor of Approach Channel		grass, weeds
b) Weir and Training Walls		
General Condition of Concrete		left wall - poor
Rust or Staining		none observed
Spalling		severe
Any Visible Reinforcing		none
Any Seepage of Efflorescence		none
Drain Holes		
c) Discharge Channel		
General Condition		poor
Loose Rock Overhanging Channel		none observed
Trees Overhanging Channel		
Floor of Channel		brush, small trees in channel. Riprap cover is overgrown
Other Obstructions		

PERIODIC INSPECTION CHECK LIST

PROJECT Big Pond Dam DATE April 2, 1980

PROJECT FEATURE Stone Retaining Wall BY PMH, JBC, MP, MB

AREA EVALUATED		CONDITION
OUTLET WORKS-OUTLET STRUCTURE AND OUTLET CHANNEL		
General Condition of Concrete		loose stone, needs repair
Rust or Staining		N/A
Spalling		N/A
Erosion or Cavitation		some settlement at center
Visible Reinforcing		N/A
Any Seepage or Efflorescence		at left side of arch conduit outlet
Condition at Joints		N/A
Drain Holes		N/A
Channel		
Loose Rock or Trees Overhanging Channel		some trees
Condition of Discharge Channel		poor

APPENDIX B

ENGINEERING DATA AND CORRESPONDENCE

BIG POND DAM

EXISTING PLANS

No Information Available

SUMMARY OF DATA AND CORRESPONDENCE

No. _____

Inventoried By _____

Date _____

WATER RESOURCES COMMISSION
SUPERVISION OF DAMS
INVENTORY DATA

Long 72-10.5 /
Lat -41-40.3

CT-194

Name of Dam or Pond Big Pond

Code No. S 12.9 PS 09

Nearest Street Location _____

Town WINDHAM

U.S.G.S. Quad. WILLIMANTIC

ok 1/73

Name of Stream PIGEON SWAMP BROOK

Owner ~~of rights!?~~ Baer, Inc. % (Pres.) Sherman Baer

Address Camp Kendale ~~215 Fishing Rait~~
South Windham ~~Stamford Conn~~
DIEHL CORP 06903

Pond Used For REC DA 2.175m

Dimensions of Pond: Width _____ Length _____ Area 31 A

Total Length of Dam 523.5' Length of Spillway 23.5

Location of Spillway west end of dam

Height of Pond Above Stream Bed 8'

Height of Embankment Above Spillway 2.5'

Type of Spillway Construction Stone ~~Earth~~ and concrete face

Type of Dike Construction Earth and concrete

Downstream Conditions _____

Summary of File Data _____

Remarks Uncle 9th Windham Fire dep.

Built 1870?

Class _____

INTERDEPARTMENT MESSAGE

STO 201 12-69

SAVE TIME: *Handwritten messages are acceptable. Use carbon if you really need a copy. If typewritten, ignore faint lines.*

TO	File	AGENCY	Water Resources Commission	DATE	April 8, 1971
FROM	William H. O'Brien, III Civil Engineer	AGENCY	Water Resources Commission	TELEPHONE	
SUBJECT	Big Pond Dam, Windham				

On March 29, 1971 the undersigned spoke with Mr. H. L. Diehl and reinspected the dam with him on this date.

He stated that he had had an engineer come up with a preliminary estimate of $10,000 to make the type of engineering study or report which we had requested in the order. He would not divulge the name of this engineer. I told him that in my opinion this estimate was grossly in excess of the scope of information necessary to determine what repairs or modifications were necessary to place this structure in a safe condition. It was my strong recommendation that he obtain the services of an engineer thoroughly familiar with developing hydrological and hydraulic data and that it would be necessary for this type of study to be made in order to determine how much work would be necessary to provide additional spillway capacity and to develop cost figures for possible alternate means of providing this capacity.

Mr. Diehl stated that the Board of Fisheries and Game is interested in acquiring this property and he would appreciate an extension of time until this matter is resolved. I requested that he put this in writing before the next Commission meeting (April 19th) and bring out any facts which he may wish to bring out and that this matter would be discussed at the April 19th Commission meeting. Mr. Diehl agreed to do this.

William H. O'Brien, III

Civil Engineer

WHO:ljg

SAVE TIME: *If convenient, handwrite reply to sender on this same sheet.*

H. L. DIEHL COMPANY INC.

CABLE ADDRESS: HLDCO

SOUTH WINDHAM, CONNECTICUT 06266 • TELEPHONE AREA CODE (203) 423-7741

STATE WATER RESOURCES COMMISSION
RECEIVED
APR 16 1971
ANSWERED
REFERRED
FILED

April 15, 1971

Mr. John J. Curry
Director
Water Resources Commission
State Office Building
Hartford, Connecticut 06115

Dear Commissioner:

This is in regards to your requests regarding our dam. We are now starting to clear the brush which was your original request. We hope to have this completed in the near future.

We have some thoughts about removing this dam. However, the Fish and Game Department of the state have shown some interest in obtaining the lake. They are now running a survey on the feasability of this purchase. Also, there is a camp using this lake and in all fairness to them, would like to discuss this with them. These will take some time, and consequently, would like an extension on your request.

We might add, this has been a rough year from an economic standpoint. We moved into our new facilities about two years ago. We have many projects to complete in getting our plant operating in a profitable manner. We, consequently, have to be conservative in our undertakings.

We would also like to mention this dam has been in operation for approximately 100 years. Many of the responsible old timers tell us - "It looks the same way as it did 35 years ago". We are safety conscious. We also have to be careful in our expenditures if we are to develop a sound business in our present location.

With best wishes, we remain

Cordially yours,

H. L. DIEHL COMPANY, INC.

H. L. DIEHL
PRESIDENT

HLD:cml
CC: William O'Brien
Civil Engineer

INTERDEPARTMENT MESSAGE

6TO-201 12-69

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Use carbon if you really need a copy. If typewritten, ignore faint lines.

TO	AGENCY	DATE
File	Water & Related Resources	Jan. 18, 1972
FROM	**AGENCY**	**TELEPHONE**
William H. O'Brien, III Civil Engineer	Water & Related Resources	

SUBJECT Big Pond Dam, Windham - File Summary

February 22, 1971 - quoting from the minutes of the Water Resources Commission meeting of that day "The Staff reported that this dam had been inspected and found to be in an unsafe condition and noted that correspondence requesting that corrective work be done has been unanswered and has failed to produce the necessary action to correct the situation. The Commission VOTED to issue an order directing that the dam be placed in a satisfactory condition or removed. An engineer's report on the dam is to be submitted within one month. Plans for the repair or removal of the dam are to be submitted by June 30, 1971 and the work accomplished by September 30, 1971."

April 26, 1971 - quoting from the minutes of the Water Resources Commission meeting of that day "The Commission considered a request from the H. L. Diehl Company, Inc. for an extension of the deadlines on the Order issued February 24, 1971 concerning the submission of an engineer's report on the safety of Big Pond Dam. The Commission VOTED to extend the date of this submission to June 30, 1971.

W. H. O'Brien

Civil Engineer

WHO:ljg

H. L. DIEHL COMPANY INC.
CABLE ADDRESS: HLDCO

SOUTH WINDHAM, CONNECTICUT 06266 • TELEPHONE AREA CODE (203) 423-7741

June 14, 1972

Mr. Stephen C. Thomson, Director
Water and Related Resources
State of Connecticut
Department of Environmental Protection
State Office Building
Hartford, Connecticut 06115

Dear Mr. Thomson:

Thank you for your letter of June 9th. We appreciate your meeting with the Land Acquisition Unit of your department to discuss the purchase of our pond. Thank you for your efforts in our behalf.

At the present time, we have practically completed cutting the trees and brush as you requested. We believe we have done this thoroughly and would appreciate a visit from someone in your department to ascertain if our work has been adequately done.

As we mentioned during our meetings with you, we have recently taken on these premises. We have worked hard to develop a business and borrowing power has its limits. Engineering services come very high these days. Actually, this money would have to come from the development of our business.

We would like to mention that this dam has been in existence for many years. I am an engineer, although not certified as such in the State of Connecticut. I, personally, however, have observed this pond during periods of high winds, rain, and high water levels and it is my honest opinion that it is adequate.

We would appreciate leniency on this. We realize that any failures will be our sole responsibility. If forced to a conclusion, we are contemplating removing the dam. We believe this is our prerogative. From an ethical standpoint, however, we question the overall effects as our dam does act as a large water plateau.

We are writing this letter very honestly and sincerely. We have always attempted to do our best in the interest of the State of Connecticut. With business as it is today, we are pushing to use our resources to the best of our ability and to the best advantage in order that we might keep a steady employment in our plant.

With best wishes, we remain

Cordially yours,

H. L. DIEHL COMPANY, INC.

H. L. DIEHL
PRESIDENT

HLD:cml

Interdepartment Message

STO-201 REV. 3/77 STATE OF CONNECTICUT
(Stock No. 6918 051 011)

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Use carbon if you really need a copy. If typewritten, ignore faint lines.

	NAME	TITLE	DATE
To	Victor F. Galgowski	Supt. of Dam Maintenance	21 December 1977
	AGENCY: Environmental Protection	ADDRESS	
From	NAME: Charles J. Pelletier	TITLE: Consultant	EXTENSION
	AGENCY: Environmental Protection	ADDRESS	
SUBJECT	Big Pond, Windham		

On December 20, 1977, the undersigned made a brief surficial inspection of the subject dam. The dam is earth fill with a concrete wall along most of the upstream side and masonry wall along part of the downstream side. There is an overflow spillway about 20 feet long. To the east from the spillway, there is a drawdown gate, which discharges through a masonry tunnel under the dam. It appeared that either the gate is partly open or there is leakage into the tunnel near the upstream side of the dam.

At the east end of the dam, there is an emergency overflow spillway on original ground. The overflow elevation is about one foot above the principal spillway.

The dam appears to be in good condition with the following deficiencies noted:

1. Trees and brush growing on and adjacent to the dam should be removed.

2. There is considerable leakage flow on the downstream side of the dam at two points near the east end of the dam.

3. The concrete wall is deteriorating most noticeably near the east end.

4. Some repairs to the spillway masonry replacement of adjacent earthwork are required.

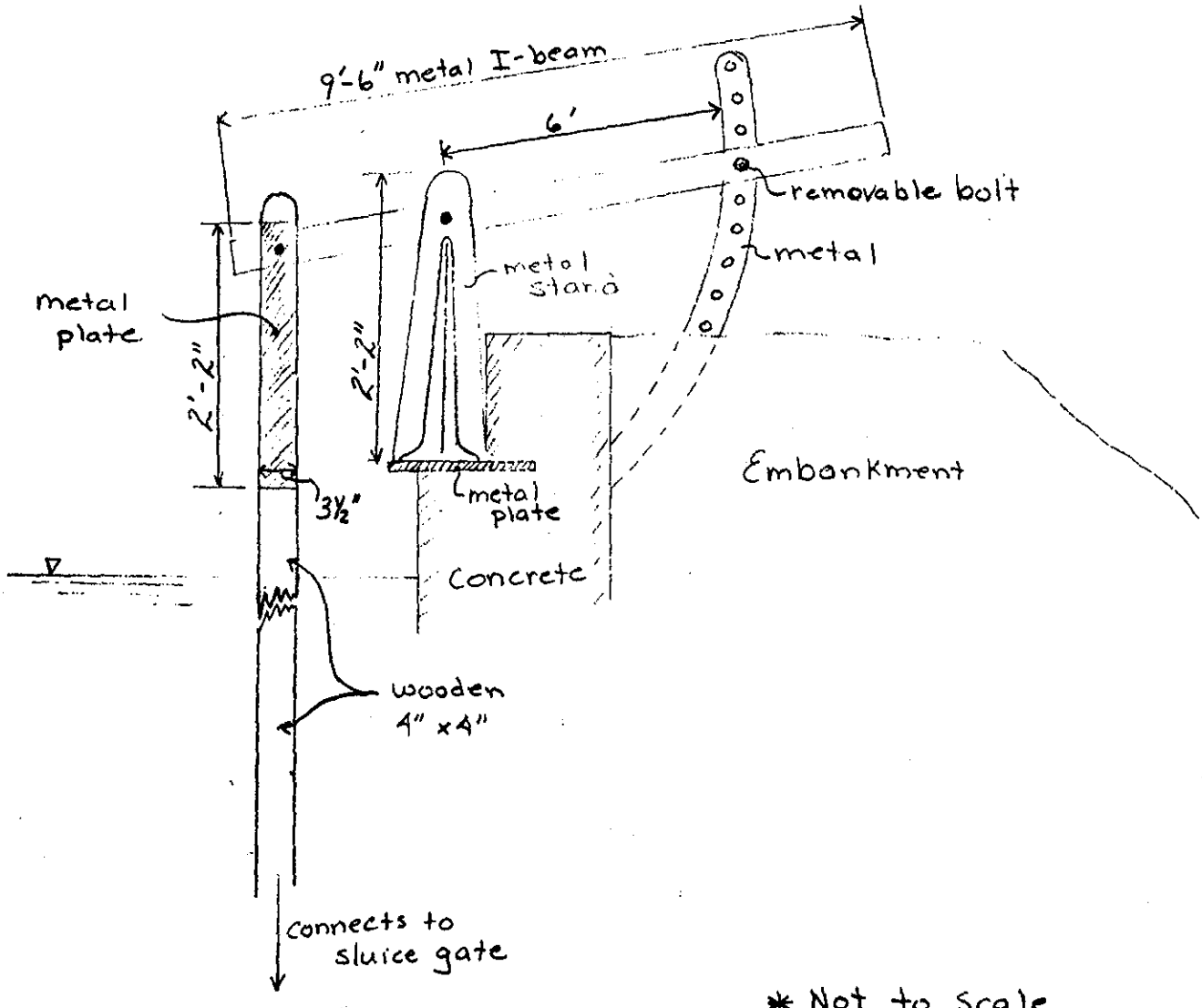
5. Possible leakage at the drawdown gate.

6. Possible leakage adjacent to the spillway.

The record of previous work and inspections of this structure indicate the possibility of a deficiency in spillway capacity and freeboard. The earth fill is generally higher than the concrete wall and is not level.

★ In the event acquisition is considered, a sufficient land area should be obtained so as to include all of the emergency overflow area.

CJP:ljk



* Not to Scale

CONFIGURATION FOR SLUICE GATE MECHANISM

Done by: Jay A. Costello
CAHN ENGINEERS

Date: May 30, 1980

APPENDIX C

DETAIL PHOTOGRAPHS

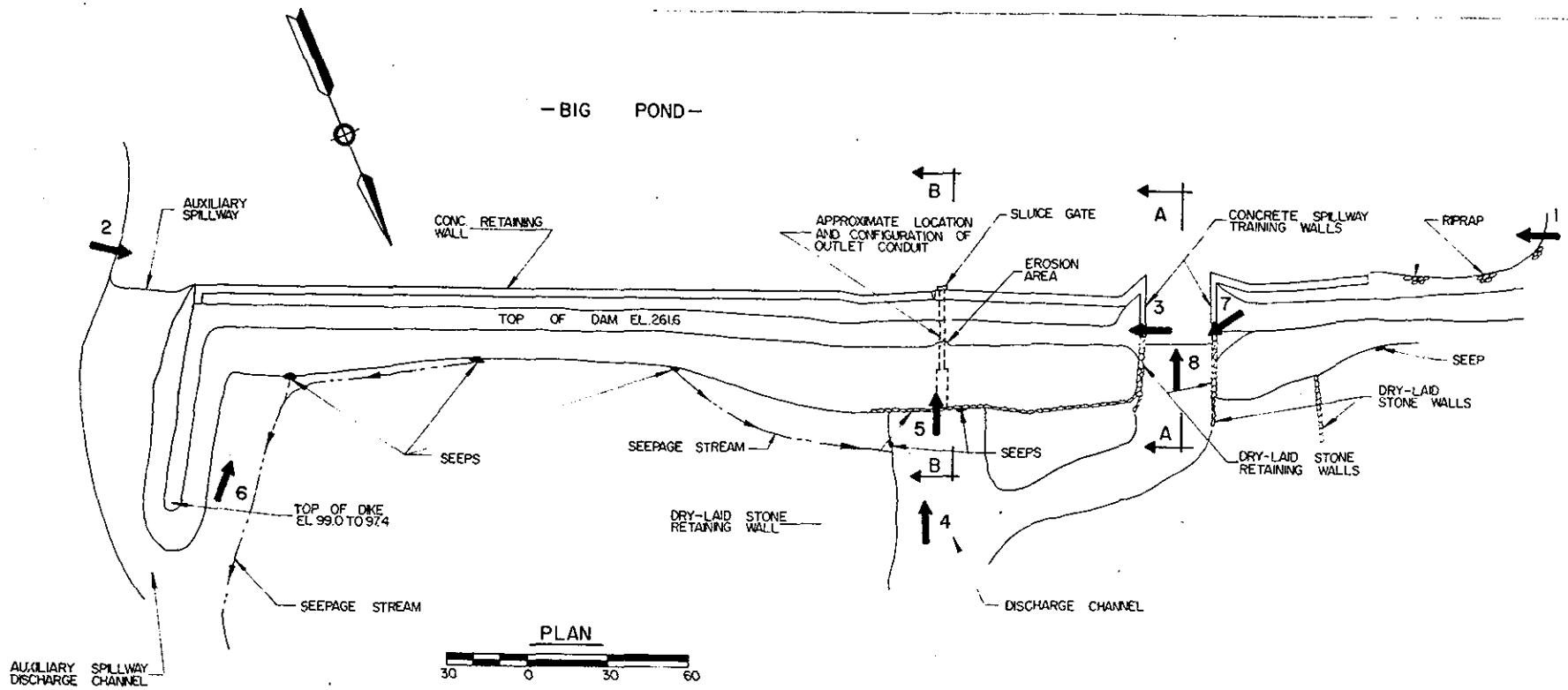


PHOTO LOCATION PLAN

BIG POND DAM

SHEET C-1

Photo 1 - Upstream slope from left abutment. Spillway at upper center and outlet mechanism to right of spillway. (April, 1980)

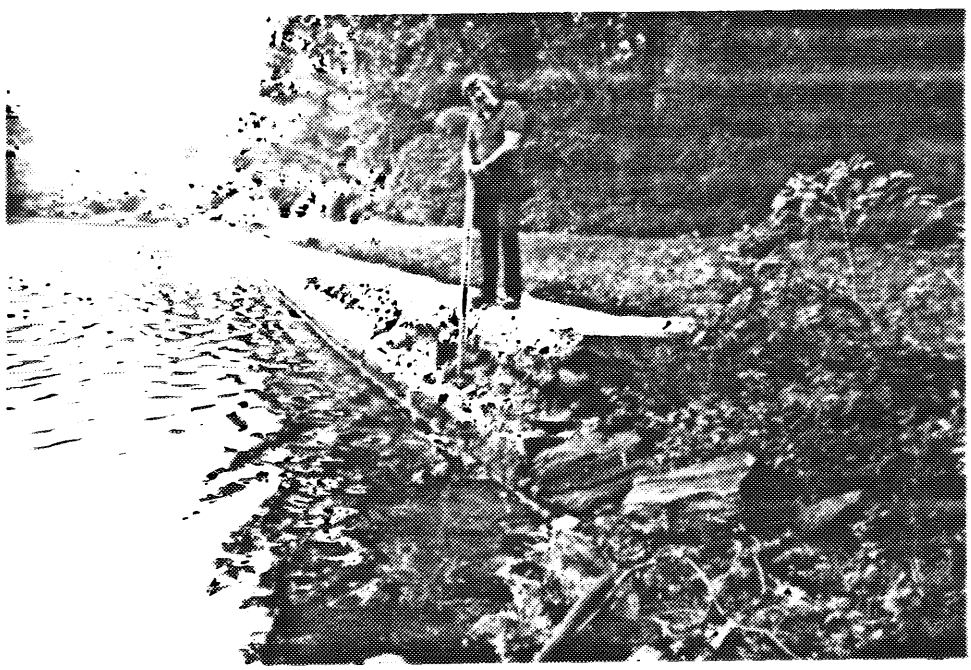


Photo 2 - Upstream slope from right abutment. Left training wall for auxiliary spillway at right. (April, 1980)

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.	NATIONAL PROGRAM OF	Big Pond Dam Pigeon Swamp Brook South Windham, Ct.
CAHN ENGINEERS INC. WALLINGFORD, CONN. ENGINEER	INSPECTION OF NON-FED. DAMS	CE# 27 785 KD DATE Aug. 1980 PAGE C-1

Photo 3 - Crest of dam from right spillway training wall. (April, 1980)

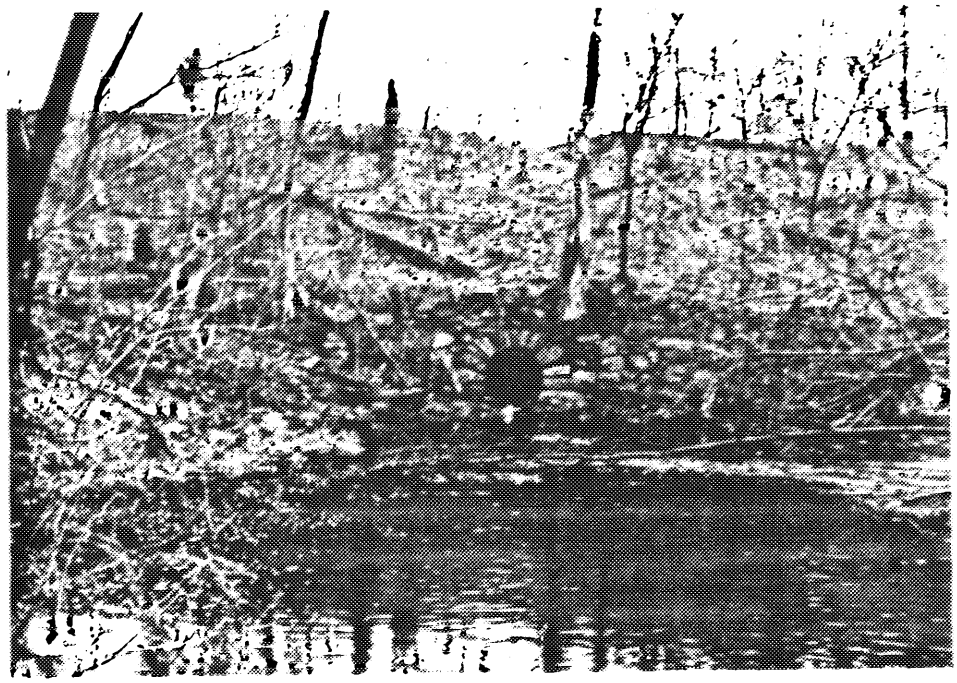


Photo 4 - Downstream slope, dry-laid stone retaining wall and low-level outlet conduit. (April, 1980)

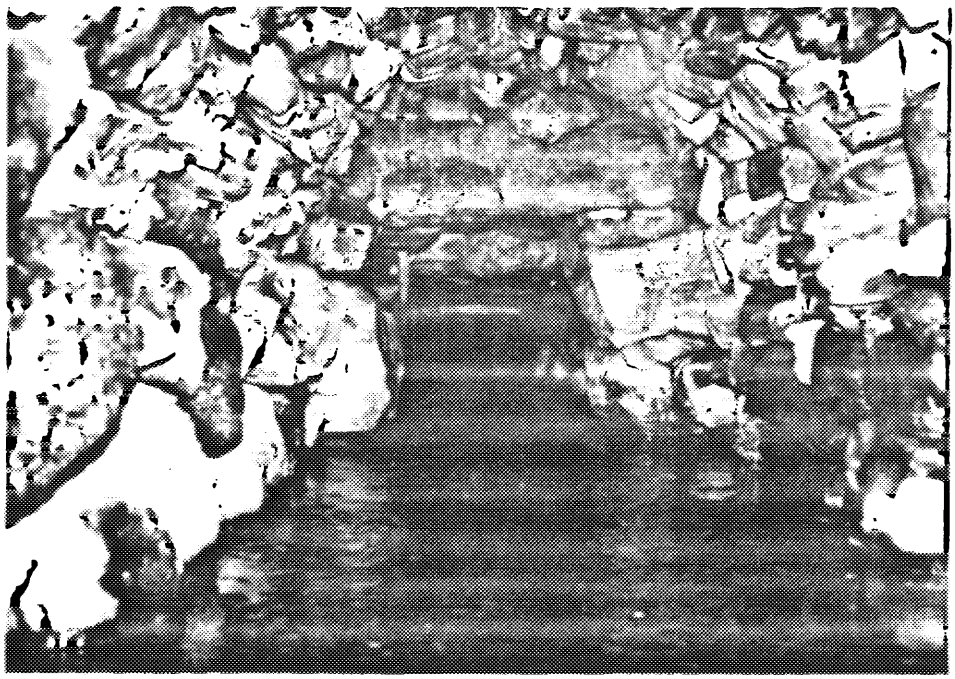


Photo 5 - Low-level stone outlet conduit from downstream. (April, 1980)

Photo 6 - Seepage stream from the toe of the embankment at the right end of the dam. (April, 1980)

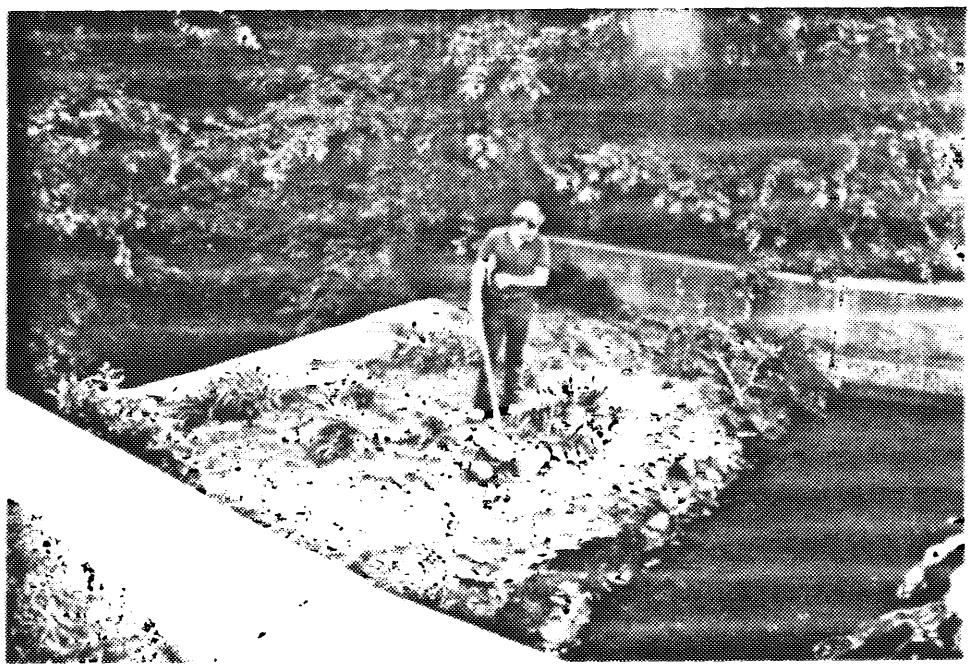


Photo 7 - Principal spillway from left training wall (July 1980).

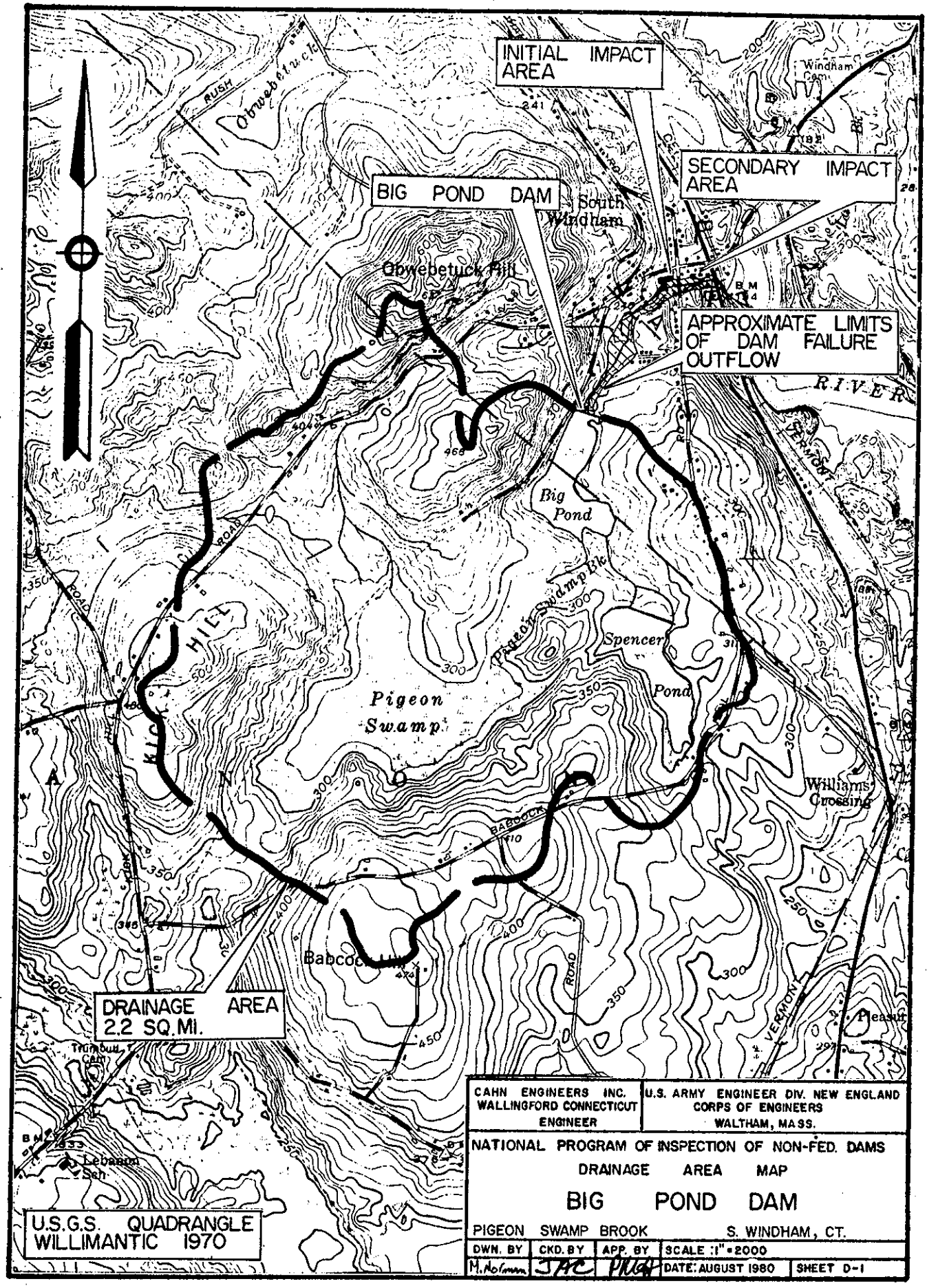
Photo 8 - Principal spillway from discharge channel (July 1980).

Photo 9 - Undermining of spillway training walls (July 1980).

Photo 10 - Seepage emanating through downstream face of spillway weir and under channel lining (July 1980).

APPENDIX D

HYDRAULICS/HYDROLOGIC COMPUTATIONS



CAHN ENGINEERS INC. WALLINGFORD CONNECTICUT ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

DRAINAGE AREA MAP

BIG POND DAM

PIGEON SWAMP BROOK S. WINDHAM, CT.

DWN. BY	CKD. BY	APP. BY	SCALE :1" = 2000	
M. Norman	JAC	PMG	DATE: AUGUST 1980	SHEET D-1

PROJECT NON FEDERAL DAM INSPECTION PROJECT NO. 80-10-14 SHEET 1 OF 21
NEW ENGLAND DIVISION COMPUTED BY MA DATE 6/23/80
BIG POND DAM CHECKED BY Eb DATE 6/24/80

PROBABLE MAXIMUM FLOOD (PMF) DETERMINATION

DRAINAGE AREA—
TOTAL DRAINAGE AREA = 2.17 SQ. MILES
OBTAINED FROM CONN. STATE DEP BULLETIN NO. 1, 1972 (GAZETTEER of NATURAL DRAINAGE AREAS, P. 10) AND INCLUDES DRAINAGE AREA FOR SPENCER POND UPSTREAM OF BIG POND.

WATERSHED CLASSIFICATION- "ROLLING" TO "FLAT".
THIS CLASSIFICATION IS ASSIGNED BY EXAMINING THE USGS MAP.

PMF PEAK INFLOW—
A SIGNIFICANT PORTION OF THE DRAINAGE AREA IS FLAT LAND, SWAMP AND WATER BODY. THE DRAINAGE AREA FOR SPENCER POND IS MEASURED TO BE 11% OF THE TOTAL DRAINAGE AREA. THE SURFACE AREA OF THE TWO PONDS IS MEASURED TO BE 5% OF THE TOTAL DRAINAGE AREA. ALSO, PIGEON SWAMP OCCUPIES A SIGNIFICANT PORTION OF THE DRAINAGE AREA.

CONSIDERING THE ABOVE FACTORS, A PMF IS SELECTED WITH AN INTENSITY IN BETWEEN "ROLLING" AND "FLAT" TERRAIN FOR 2.17 SQ. MILES DRAINAGE AREA FROM THE CORPS OF ENGINEERS DECEMBER 1977 PEAK FLOW RATES GUIDE CURVES.

THE SELECTED INTENSITY = 1500 CFS / SQ. MILE
∴ PMF PEAK INFLOW = 1500 × 2.17 ≅ 3250 CFS

SIZE CLASSIFICATION—
FOR THE PURPOSE OF DETERMINING PROJECT SIZE, THE MAXIMUM STORAGE ELEVATION IS CONSIDERED EQUAL TO THE TOP OF DAM.

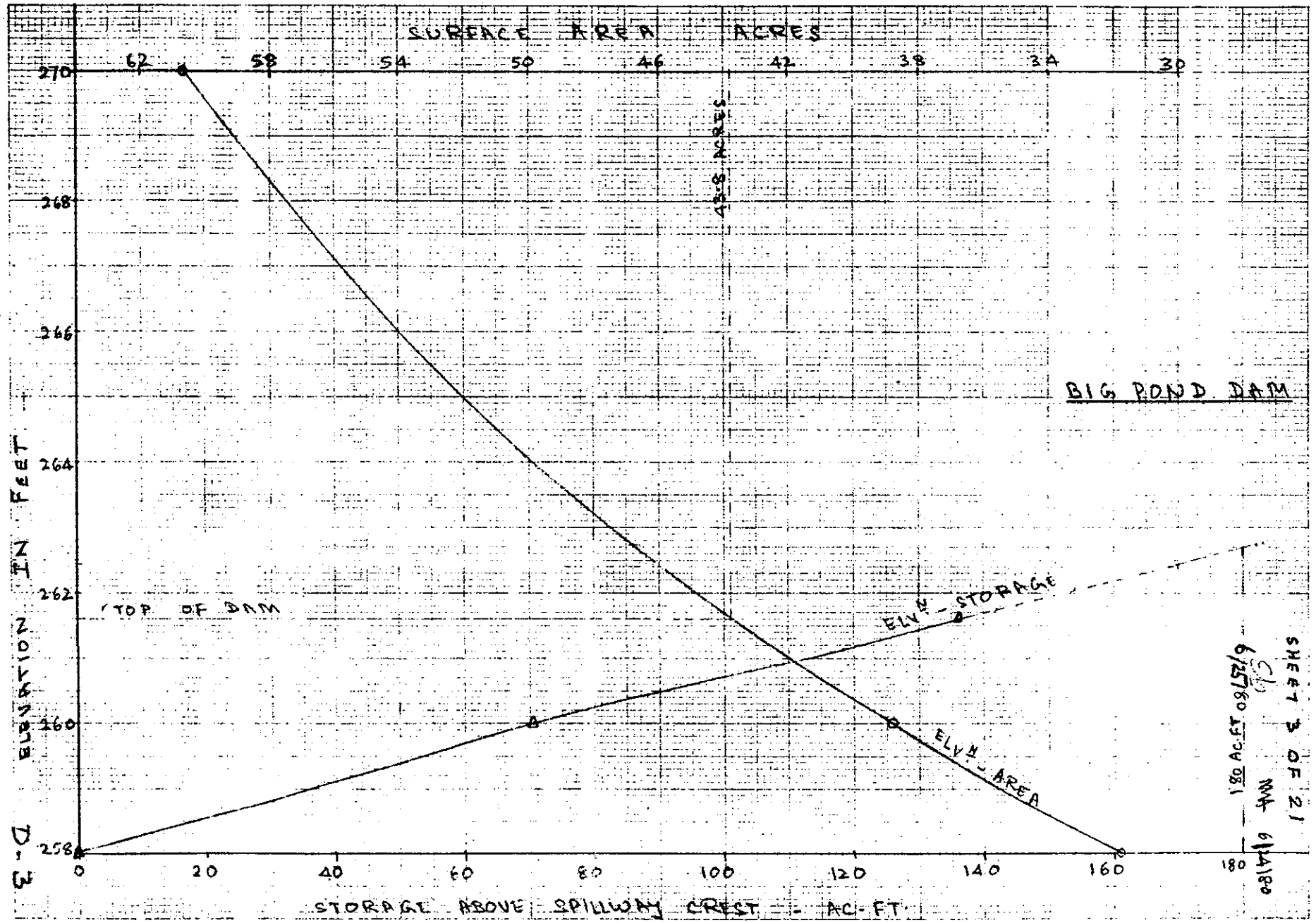
HEIGHT OF DAM = EL. 261.6* − EL. 242.4* (FROM CAHN ENGINEERS FIELD INFORMATION)
= 19.2 FEET

PLANIMETERING FROM USGS MAP FOR LAKE SURFACE AREAS—

AT EL. 258	(SPILLWAY CREST)	= 31.8 ACRES
AT EL. 260		= 38.8 ACRES
AT EL. 270		= 60.6 ACRES

A STAGE-LAKE AREA CURVE IS PLOTTED (SHEET 3)

* THE ELEVATION OF 258.0 NGVD SHOWN FOR THE POND WATER SURFACE ON THE USGS WILLIMANTIC QUADRANGLE MAP WAS ASSUMED TO BE THE ELEVATION OF THE SPILLWAY CREST AND ALL OTHER ELEVATIONS (NGVD) ARE REFERENCED TO THE ASSUMED SPILLWAY CREST ELEVATION.


SURFACE AREA ACRES
62
58
54
50
46
42
38
34
30
43.8 ACRES
270
268
266
264
262
260
258
ELEVATION IN FEET
BIG POND DAM
TOP OF DAM
ELV. - STORAGE
ELV. - AREA
0
20
40
60
80
100
120
140
160
180
STORAGE ABOVE SPILLWAY CREST - AC-FT
6,760 AC-FT
180 AC
6/14/80
SHEET 3 OF 21

LAKE AREA TO TOP OF DAM (EL. 261.6) FROM THIS CURVE = 43.8 Ac
AVERAGE LAKE AREA BETWEEN SPILLWAY CREST & TOP OF DAM = 37.8 AC
∴ MAXIMUM STORAGE BETWEEN SPILLWAY CREST & TOP OF DAM =
$3.6 \times 37.8 = 136$ AC.FT.

ESTIMATED STORAGE BELOW SPILLWAY CREST $= \frac{1}{3} bh$

$= \frac{1}{3} \times 31.8 \times 15.6$
$\cong 165$ AC.FT.

(h = DIFFERENCE OF ELEVATIONS 258.0 − 242.4)
∴ MAXIMUM IMPOUNDMENT TO TOP OF DAM = 136 + 165
= 301 AC.FT.

THUS, ACCORDING TO CORPS OF ENGINEERS GUIDELINES TABLE 2, THE BIG POND DAM IS CLASSIFIED SMALL BASED UPON THE STORAGE ($< 1000 \text{ AC} \geq 50$) EVEN THOUGH THE HEIGHT OF DAM IS < 25!
USING THE ABOVE DATA, A STAGE-STORAGE CURVE IS PLOTTED (SHEET 3) FOR LATER USE.

HAZARD POTENTIAL —
HIGH HAZARD BASED ON DAM BREACH ANALYSIS AND RELATIVE LOCATIONS OF HOUSES AND OTHER STRUCTURES. A DETAILED DISCUSSION OF HAZARD POTENTIAL IS INCLUDED AT THE END OF BREACH ANALYSIS SECTION OF APPENDIX D.

TEST FLOOD PEAK INFLOW (Q P.) —

FOR THE SMALL SIZE AND HIGH HAZARD POTENTIAL CLASSIFICATION, TABLE 3 OF CORPS OF ENGINEERS RECOMMENDED GUIDELINES, THE TEST FLOOD COULD BE IN THE $\frac{1}{2}$ PMF TO PMF RANGE. IN VIEW OF SIGNIFICANT DEVELOPMENT DOWNSTREAM OF THE DAM ADJACENT TO THE BROOK, A TEST STORM OF HIGHER MAGNITUDE OF PMF WILL BE EVALUATED.

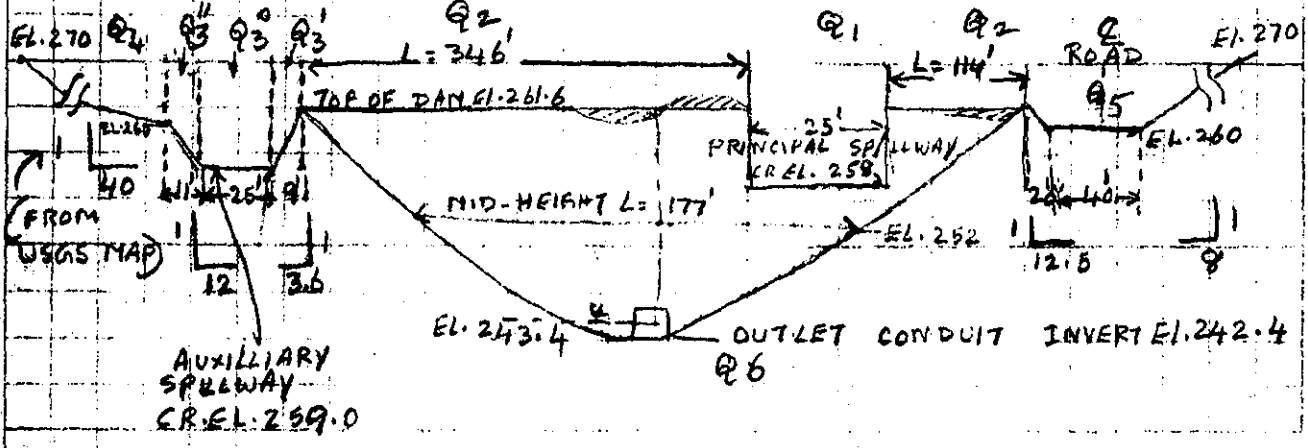
SELECTING PMF VALUE, THE TEST FLOOD PEAK INFLOW = 3250 CFS.

PMF WOULD RESULT FROM 19" RUN-OFF FROM 2.17 SQ. MILES OF DRAINAGE AREA.

$\therefore$ TOTAL STORM VOLUME = $\frac{19}{12} \times 2.17 \times 640 =$ 2200 AC.FT.

THUS, MAXIMUM STORAGE (BETWEEN SPILLWAY CREST AND TOP OF DAM) OF 136 AC.FT IS ONLY 6% OF THIS STORM VOLUME.

TEST FLOOD ANALYSIS.



POTENTIAL FLOOD OVERFLOW PROFILE.

THE DISCHARGE CAPACITIES ARE CALCULATED BY DEVELOPING THE EQUATIONS BELOW AND TABULATED ON SHEET 8.

SPILLWAY — BROAD-CRESTED STONE MASONRY WEIR 25' LONG
$Q_1 = CLH^{3/2}$ FOR C = 3.0 ASSUMED, (REF: USGS BOOK 3, "MEASUREMENT OF PEAK DISCHARGES AT DAMS BY INDIRECT METHODS" CHAPTER 5A, P.10, FIG. 7)
$= 75H^{3/2}$ CR. EL = 258.0, L = 25'

DAM — $Q_2 = CLH^{3/2}$ FOR C = 2.7 ASSUMED. (IRREGULAR CREST)
CR. EL. 261.6, L = 346' + 114' = 460'

THE CREST OF THE DAM IS UNEVEN; HOWEVER A CREST ELEVATION OF 261.6 IS TAKEN AS A REPRESENTATIVE ELEVATION. FURTHER, DUE TO THE IRREGULAR CREST, THE AREA OF FLOW AND THEREFORE THE DISCHARGE CAPACITY OVER THE DAM, IS ASSUMED TO COMPENSATE THE DISCHARGE (Q_5) OVER THE ROAD SWALE ON THE LEFT OF THE DAM.

$\therefore Q_2 = 1242H^{3/2}$

AUXILLARY SPILLWAY Q_3 — REFER TO SKETCH ON SHEET 6 FOR DIMENSIONS & ELEVATIONS.

THE DISCHARGE Q_3^0 FROM THE HORIZONTAL SECTION OF THE AUXILLARY SPILLWAY IS COMPUTED BY

$Q_3^0 = CLH^{3/2}$
$= 62.5\,H^{3/2}$

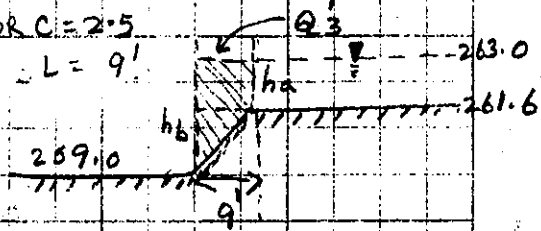
$C = 2.5$ (GRASSED CHANNEL)
$L = 25'$
CREL. = 259.0

THE DISCHARGE Q_3^1 FROM THE INCLINED SECTION OF THE AUXILLARY SPILLWAY IS COMPUTED BY THE USGS METHOD *

$$Q_3^1 = \frac{2}{5}\frac{CL}{(h_b - h_a)}\left(h_b^{5/2} - h_a^{5/2}\right)$$

$$= \frac{q}{(h_b - h_a)} \times \left(h_b^{5/2} - h_a^{5/2}\right)$$

FOR C = 2.5
L = 9'



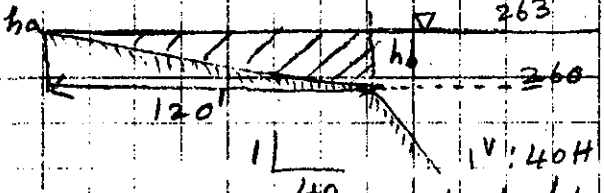
$h_a = 0$ UPTO EL. 261.6

SIMILARLY Q_3'' IS COMPUTED BY THE USGS METHOD.

RIGHT EMBANKMENT

$Q_4 = 0.4\,C_4 h_b^{3/2}$
$= 0.4 \times 2 \times 40 h_b \times h_b^{3/2}$
$= 32\,h_b^{5/2}$

$C = 2.0$ (NATURAL GROUND)



* USGS RECOMMENDED FORMULA FOR MORE PRECISE DISCHARGE OVER INCLINED DAM/EMBANKMENT CREST (REF: MEASUREMENT OF PEAK DISCHARGES AT DAMS BY INDIRECT METHODS, USGS BOOK 3, CHAPTER A-5, PAGES 3-4, 1968)

ROAD SWALE — LEFT OF THE DAM
THE DISCHARGE Q_5 OVER THIS ROAD SWALE IS ASSUMED TO BE ACCOUNTED FOR BY COMPENSATORY NON OVERFLOW PORTIONS OF THE DAM ABOVE EL 261.6.

THUS, $Q_5 = 0$.

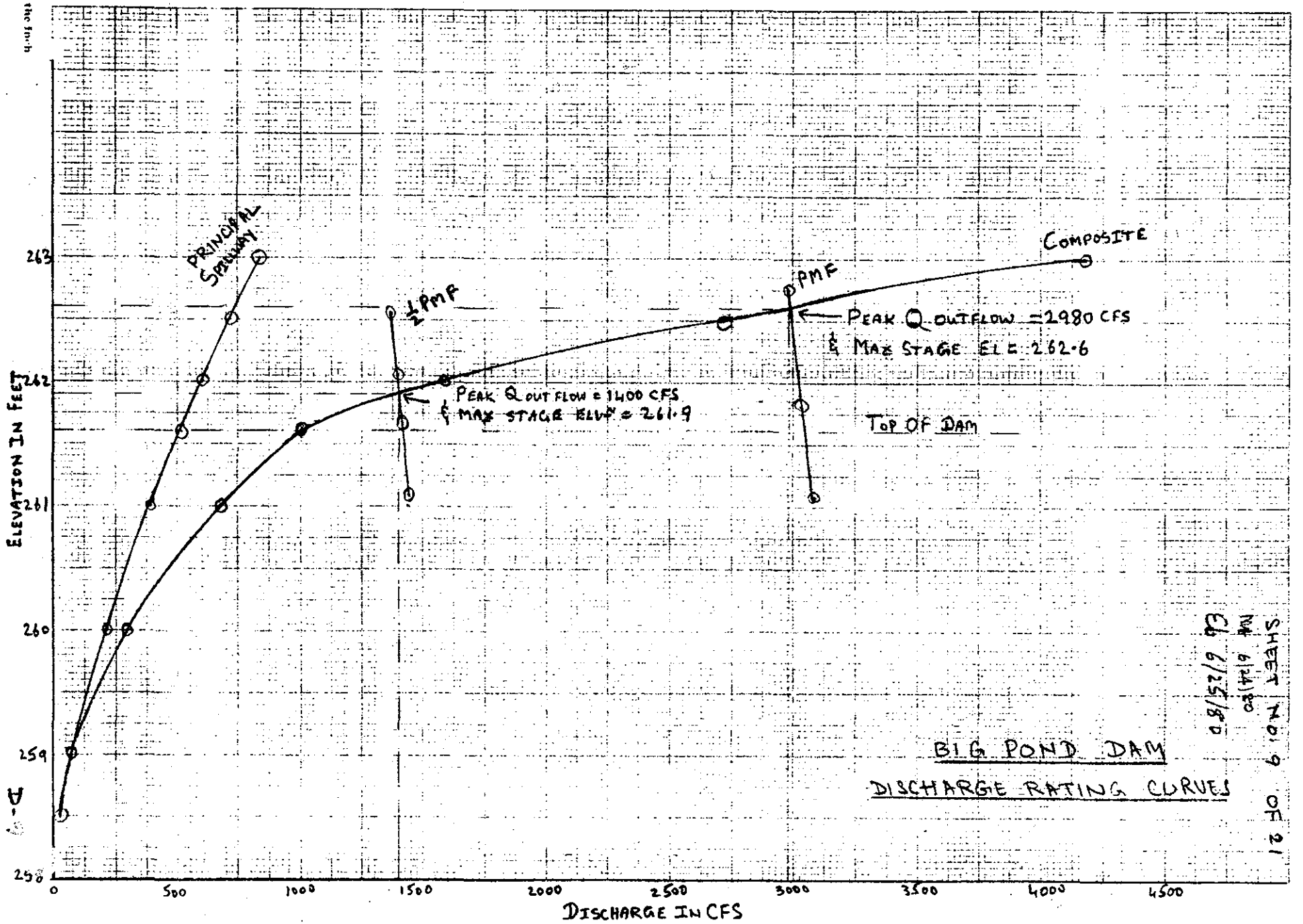
LOW LEVEL OUTLET — CONDUIT DIMENSION = 2 FT x 2 FT (FROM CAHN ENGINEERS FIELD INFORMATION). AND THE DISCHARGE FOR POOL AT TOP OF DAM IS ESTIMATED TO BE 88 CFS ACCOUNTING FOR USUAL LOSSES.

TABULATION OF DISCHARGE RATES (CFS)

	ELVN.	PRINCIPAL SPILLWAY Q_1 EL = 258	DAM Q_2 EL = 261.6	AUX. SPILLWAY Q_3 EL = 259	RIGHT EMBANKMENT Q_4 EL = 260	TOTAL Q.
	258.5	26	0	0	0	26
AUX SPILL. CREST	259	75	0	0	0	75
	260	212	0	82	0	294
	261	390	0	253	32	675
TOP OF DAM	261.6	512	0	384	104	1000
	262	600	314	488	181	1583
	262.5	716	1060	629	316	2721
	263	838	2057	783	499	4177
MAX^{m} POOL	262.6	740	1240	657	343	2980

NOTE 1. CONSIDERING THE TOTAL DISCHARGE CAPACITIES ABOVE, THE DISCHARGE CAPACITY OF THE LOW-LEVEL OUTLET IS NEGLECTED. WITH THE ABOVE DATA DISCHARGE RATING CURVES ARE PLOTTED (SHEET 9.)

2. THE ESTIMATED DISCHARGE FOR A REPORTED MAX^{M} PREVIOUS POOL LEVEL OF 259.9 (1.7' BELOW TOP OF DAM)
$Q_1 = 197$ CFS AND $Q_3 = 71$ CFS
TOTAL Q = 270 CFS



BIG POND DAM

DISCHARGE RATING CURVES

EB 6/25/80

MA 6/24/80

SHEET NO. 9 OF 21

A-9

DETERMINATION OF PEAK OUTFLOW

SHORTCUT ROUTING OF RESERVOIR -
FOR TEST FLOOD INFLOW OF 3250 CFS (Q_{PI}), PMF HAS 19" OF RUN-OFF FROM THE DRAINAGE AREA
FOR 3250 CFS (PMF) THE DISCHARGE RATING CURVE GIVES EL = 262.75
AND FROM STAGE-STORAGE CURVE FOR THIS ELV^N, STORAGE $\cong$ 180 AC. FT.

$$STOR_i = \frac{180 \times 12}{2.17 \times 640} = 1.55'' \text{ OF RUN OFF.}$$

$$Q_{P_i} = Q_{P_1}\left(1 - \frac{STOR_i}{19}\right)$$

① $STOR_i$ INCHES	② $\left(1 - \frac{STOR_i}{19}\right)$	③ $STOR_i$ AC FT ① $\times \frac{2.17 \times 640}{12}$	④ Q_{P_i} CFS ② $\times$ 3250	⑤ ELV^N FROM STORAGE-CURVE USING ③
1.00	0.95	116	3088	261.08
1.25	0.93	145	3033	261.8
1.55	0.92	180	2990	262.75

COLUMN ④ & ⑤ ARE PLOTTED ON DISCHARGE RATING CURVE.

PEAK OUTFLOW Q = 2980 CFS
MAX. STAGE = ELV^N. 262.6
TOP OF DAM = EL. 261.6

∴ THE DAM IS OVERTOPPED BY 1 FT.

FOR A TEST FLOOD = $\frac{1}{2}$ PMF = $\frac{1}{2} \times 3250 = 1625$ CFS

DETERMINATION OF PEAK OUTFLOW:
SHORT CUT ROUTING OF RESERVOIR —
FOR TEST FLOOD INFLOW OF 1625 CFS
FOR 1625 CFS ($\frac{1}{2}$ PMF) THE DISCHARGE RATING CURVE GIVES ELV^N = 262.05

FROM STAGE-STORAGE CURVE FOR THIS ELV^N, STORAGE = 154 AC FT.

$STOR_i = \frac{154 \times 12}{2.17 \times 640} = 1.33''$ OF RUN-OFF.

$Q_{P_i} = Q_{P_1}\left(1 - \frac{STOR_i}{9.5}\right)$

① $STOR_i$ INCHES	② $\left(1 - \frac{STOR_i}{9.5}\right)$	③ $STOR_i$ A·FT ① $\times \frac{2.17 \times 640}{12}$	④ Q_{P_i} CFS ② $\times 1625$	⑤ ELV^N FROM STORAGE CURVE USING ③
1.0	0.89	116	1446	261.08
1.2	0.87	139	1414	261.67
1.33	0.86	154	1398	262.05
1.5	0.84	174	1365	262.55

COLUMNS ④ & ⑤ ARE PLOTTED ON DISCHARGE RATING CURVE.

PEAK OUTFLOW Q = 1400 CFS
MAX STAGE ELV^N = 261.9
TOP OF DAM = EL. 261.6

∴ THE DAM IS OVERTOPPED BY 0.3 FT.

BREACH ANALYSIS — DOWNSTREAM FAILURE HAZARD

BREACH OUTFLOW $Q_b = \frac{8}{27} W_b \sqrt{g}\, y_o^{3/2}$

FROM CAHN ENGINEERS, INC, FIELD INFORMATION

HEIGHT OF THE DAM y_o = EL. 261.6 - EL. 242.4 = 19.2 FT

AT MID-HEIGHT EL. 252, LENGTH OF DAM = 177 FT

$W_b = 40\% \times 177 = 70.8$ FT USE 70 FT

$\therefore Q_b = \frac{8}{27} \times 70 \times \sqrt{32.2} \times (19.2)^{3/2} = 9900$ CFS.

PEAK FAILURE OUTFLOW = Q_b + ADDITIONAL DISCHARGES (@ TOP OF DAM)

= 9900 + 512 + 384 + 104 = 10,900 SAY 11,000 CFS

ESTIMATED FAILURE FLOOD DEPTH $\cong 0.44 y_o = 0.44 \times 19.2$

8.4 FT

PERFORM D/S ROUTING OF PEAK FAILURE OUTFLOW

SELECT A SECTION AA 1700' DOWNSTREAM OF THE DAM AT THE EDGE OF FILL MILL POND, A SMALL POND ONCE USED FOR FIRE PROTECTION PURPOSES.

USING MANNING EQUATION

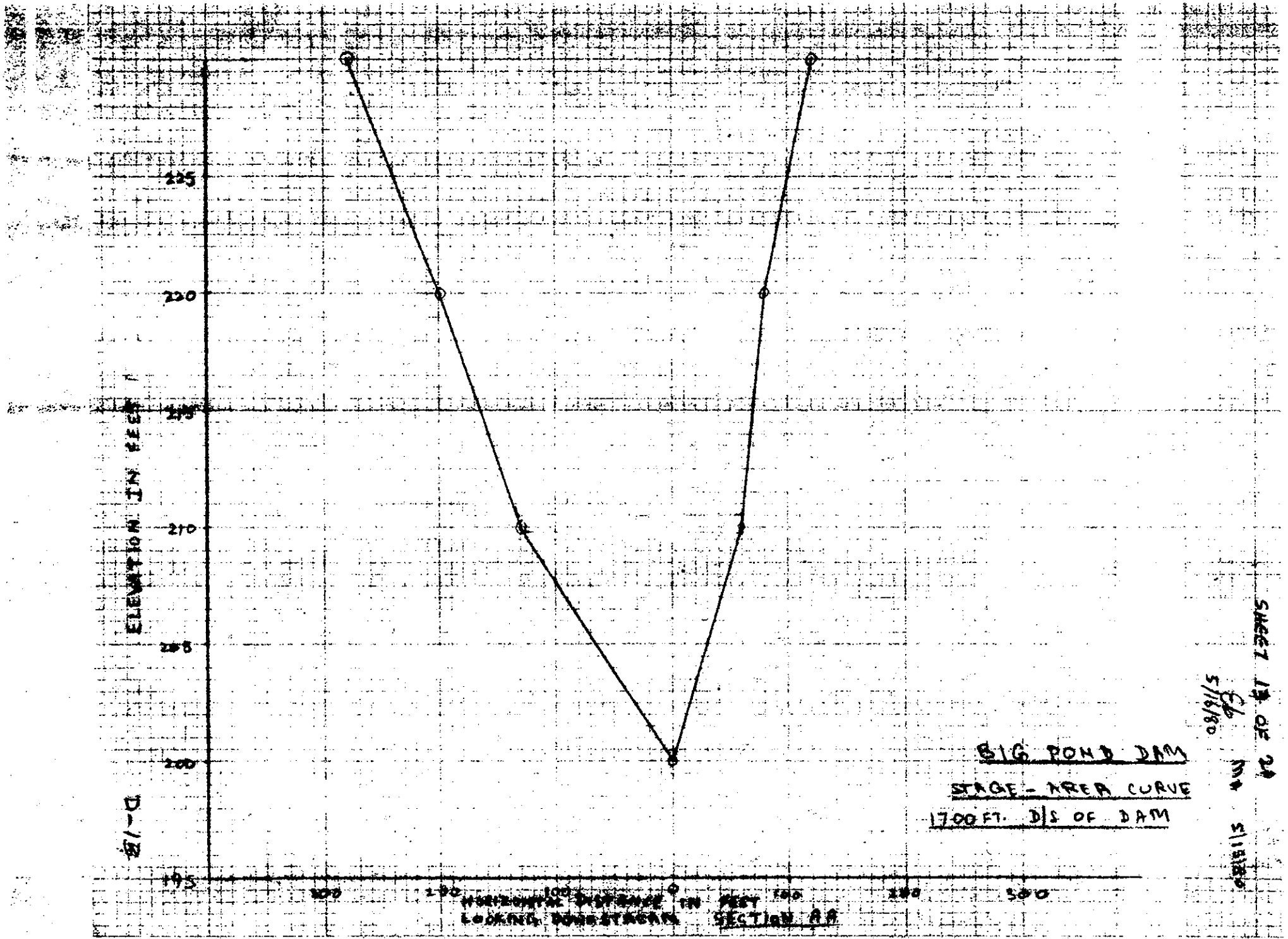
$$Q = A \times \frac{1.486}{n} \times R^{2/3} \times S^{\frac{1}{2}}$$

$$= 3.13 \times A \times R^{2/3}$$

WHERE $n = .075$ ASSUMED AND $S = .0025$ ESTIMATED FROM USGS MAP

EL.	$A_{sq.ft}$	P	$R = \frac{A}{P}$	$R^{2/3}$	Q CFS.
200	0	—	—	—	—
210	950	191	4.97	2.91	8650
215	2015	239	8.43	4.145	26,150

STAGE-AREA AND STAGE-DISCHARGE CURVES ARE PLOTTED FOR SECTION AA.



BIG POND DAM

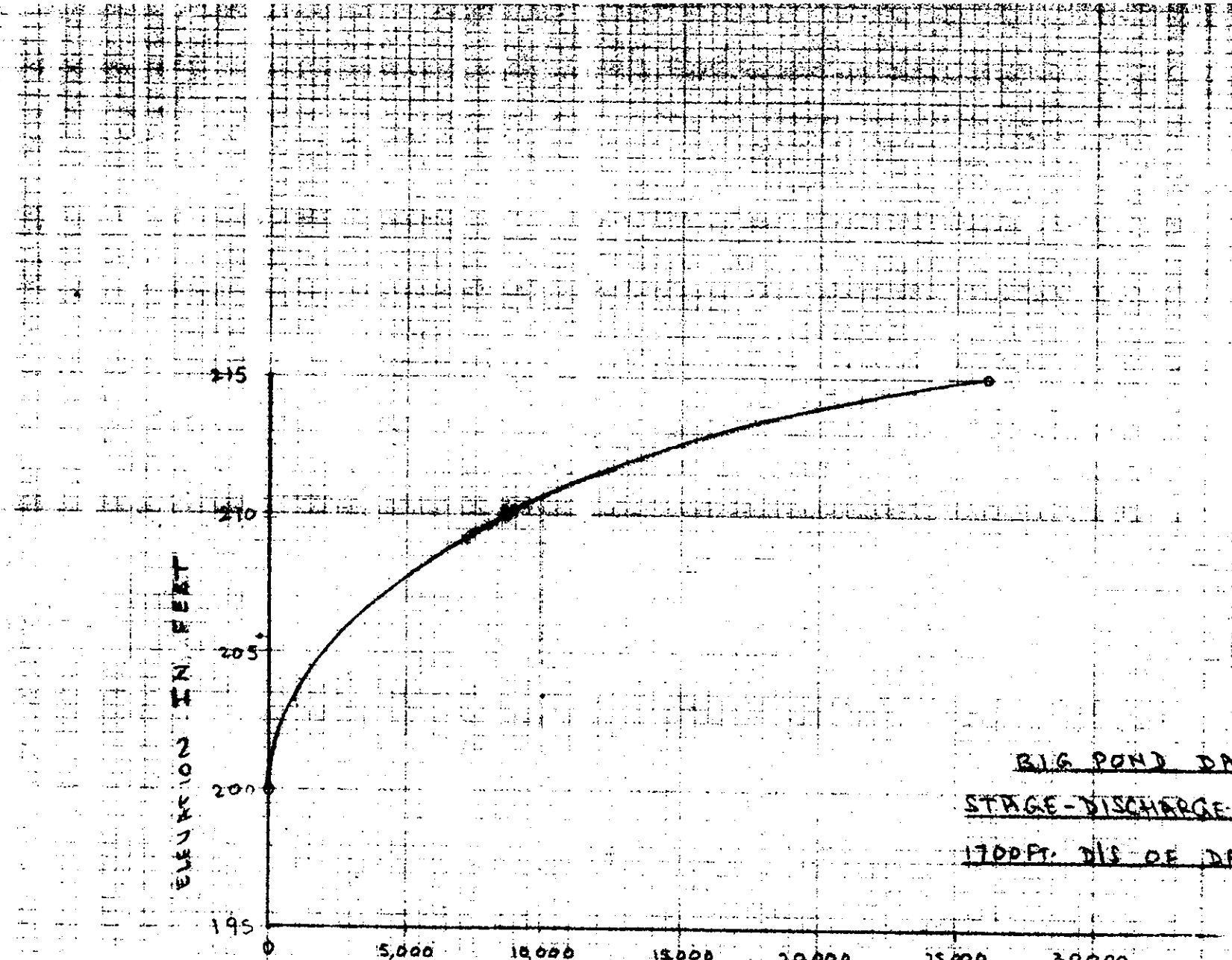
STAGE - AREA CURVE

1700 FT. D/S OF DAM

SHEET 14 OF 24

5/18/80

D-28



BIG POND DAM

STAGE-DISCHARGE CURVE

1700 FT. D/S OF DAM

SECTION AA

CJP 5/19/80

SHEET 14 OF 18

D-14

FOR PEAK FAILURE OUTFLOW Q_{P_1} = 11,000 CFS, EL^{D} = 211.2
FROM STAGE-DISCHARGE CURVE AND STAGE-AREA CURVE GIVES = 1184 Sq. Ft.

VOLUME OF REACH $V_1 = \frac{1700 \times 1184}{43,560} = 46.2$ Ac Ft

TRIAL $Q_{P_2} = Q_{P_1}\left(1 - \frac{V_1}{S}\right)$, WHERE S = TOTAL STORAGE TO TOP OF DAM

$= 11,000\left(1 - \frac{46.2}{391}\right) = 9312$ CFS

FOR THIS Q_{P_2} THE STAGE-DISCHARGE CURVE GIVES
EL. 210.4 AND AREA = 1026 Sq Ft

$\therefore V_2 = \frac{1700 \times 1026}{43,560} = 40$ Ac. Ft.

RECOMPUTING $Q_{P_2} = 11,000\left(1 - \frac{\frac{46.2 + 40}{2}}{391}\right)$

$= 9,400$ CFS

AND EL 210.4 FROM STAGE DISCHARGE CURVE.

$\therefore$ FLOOD STAGE AT SECTION AA = EL. 210.4 − EL. 200.0
= 10.4 FT.

AND VELOCITY AT SECTION AA = $\frac{9,400}{1236} = 9.$ FPS (HIGH)

SELECT SECTION BB 1200' D/S OF AA

$Q = A \times \frac{1.486}{n} \times R^{2/3} \times S^{\frac{1}{2}}$; ASSUME $n = .075$ AND
$S = 0.042$ ESTIMATED FROM USGS MAP.

$= 4.06 \times A \times R^{2/3}$

EL.	A. Sq. Ft.	P	$R = \frac{A}{P}$	$R^{\frac{2}{3}}$	Q CFS
150	0				
155	588	236	2.49	1.84	4390
160	2400	482	4.98	2.92	28,400

STAGE-AREA AND STAGE-DISCHARGE CURVES ARE PLOTTED FOR Q_{P_1} = 9,400 CFS. EL^N = 157 AND FROM STAGE-AREA CURVE, AREA = 1176 Sq. FT.

VOLUME OF REACH $V_1 = \frac{1200 \times 1176}{43,560} = 32.4$ Ac Ft.

STORAGE REMAINING $= \left(301 - \frac{46.2 + 40.}{2}\right) = 258$ AC. FT.

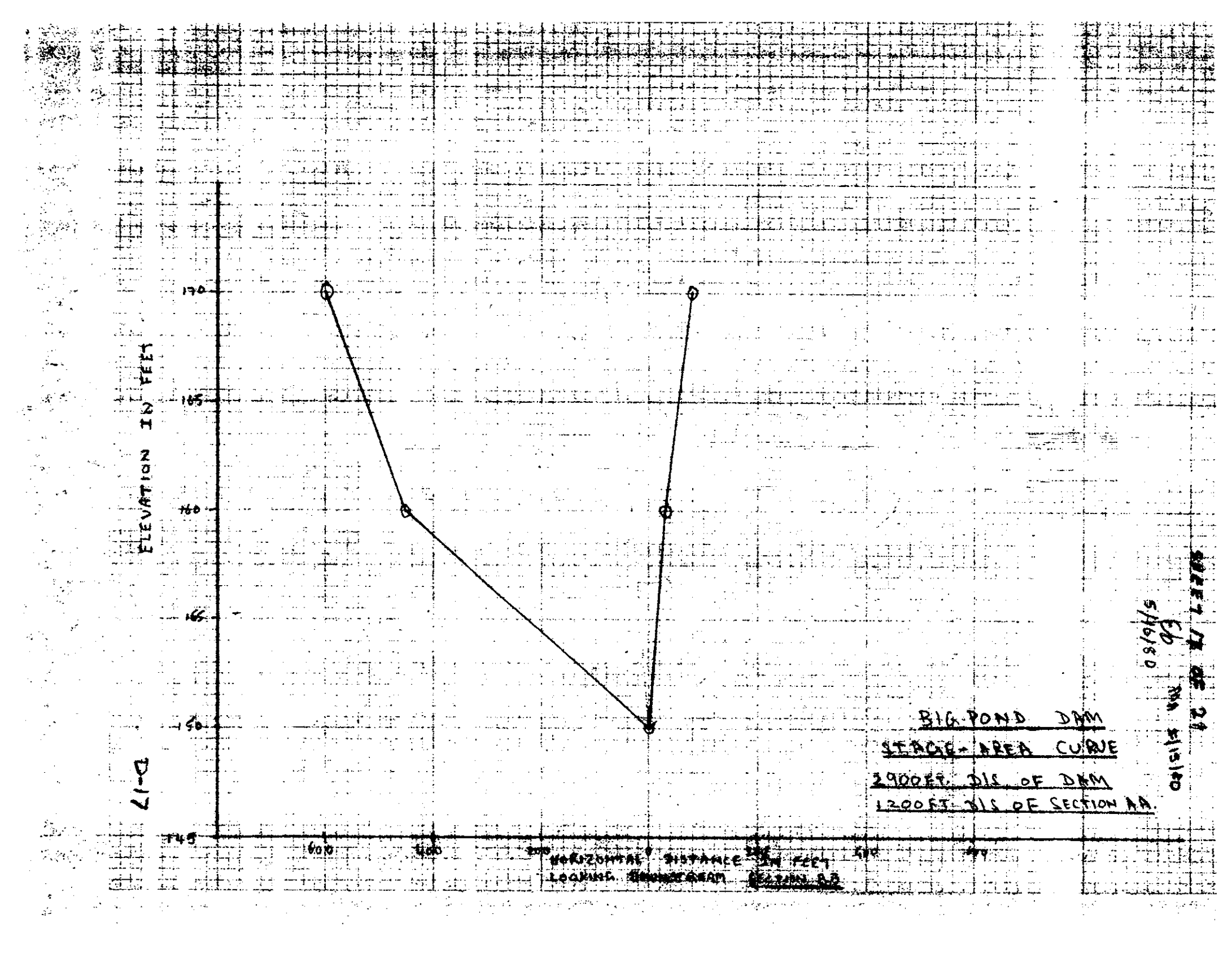
TRIAL $Q_{P_2} = Q_{P_1}\left(1 - \frac{V_1}{258}\right) = 9400\left(1 - \frac{32.4}{258}\right) = 8220$ CFS

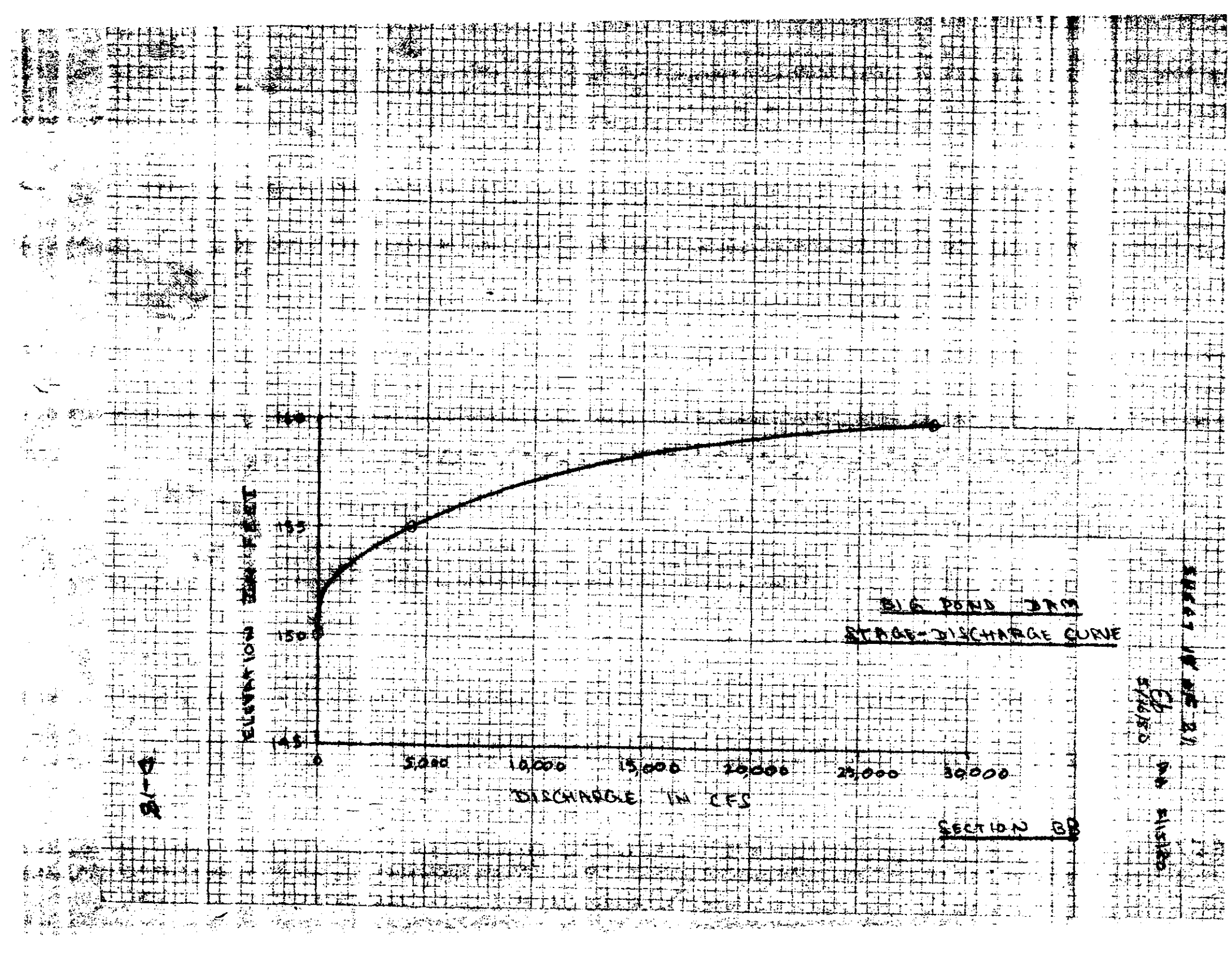
FOR 8220 CFS, EL^N = 156.7 AND A = 1072 Sq FT.

$V_2 = \frac{1200 \times 1072}{43,560} = 29.5$ Ac Ft.

RECOMPUTING $Q_{P_2} = 9400\left(1 - \frac{\frac{32.4 + 29.5}{2}}{258}\right) \simeq 8300$ CFS

AND FLOOD STAGE = EL. 156.7
∴ DEPTH OF FLOOD WATER = 6.7 FT AT SECTION BB
VELOCITY AT SECTION BB = $\frac{8300}{1100}$ = 7.5 FPS (HKH)


ELEVATION IN FEET
170
165
160
155
150
145
600
400
HORIZONTAL DISTANCE IN FEET
LOOKING DOWNSTREAM SECTION BB
BIG POND DAM
STAGE - AREA CURVE
2900 FT. DIS OF DAM
1200 FT. DIS OF SECTION AA.
SHEET 14 OF 24
5/19/80
D-17


BIG POND DAM
STAGE-DISCHARGE CURVE
SECTION B
DISCHARGE IN CFS
0
5,000
10,000
15,000
20,000
25,000
30,000
150
155
160

FAILURE HAZARD POTENTIAL

SUMMARY OF BREACH ANALYSIS RESULTS:

LOCATION	DISTANCE FT	Q CFS	CHANNEL BED ELV	FLOOD STAGE	DEPTH OF WATER FT	VELOCITY FPS
DAM	0	11,400	242.4	250.8	18.4	—
AA	1700	9,400	200.0	210.4	10.4	9
BB	2900	8,300	150.0	156.7	6.7	7.5

AT DAM BREACH, BASED ON THE ABOVE ANALYSIS ALONG WITH THE INFORMATION OBTAINED DURING FIELD VISIT, AS WELL AS THE BASIS FOR THE FLOOD VOLUME, STAGE AND VELOCITY WHICH ARE ESTIMATED TO BE OF LARGE ENOUGH MAGNITUDE TO SERIOUSLY IMPACT DOWNSTREAM BUILDINGS INCLUDING SEVERAL HOUSES AS WELL AS CULVERTS ON BABCOCK HILL ROAD AND STATE ROUTE 32.

THE BROOK FLOWS ADJACENT (SOUTHERN PERIMETER) TO H.L. DIEHL CO. COMPLEX, WHICH CONSISTS OF A LARGE MANUFACTURING BUILDING AND SEVERAL WAREHOUSES. THIS COMPLEX IS LOCATED APPROX. 2300 FT DOWNSTREAM OF THE BIG POND DAM. SEVERAL OF THESE BUILDINGS ARE LOCATED ONLY 4± FEET ABOVE THE CHANNEL BED, AND ONE OF THE WAREHOUSES SPANS THE BROOK. IN ADDITION, ANOTHER BUILDING CONTAINING THE OFFICES OF PRATT & KLEWIN IS LOCATED ON BABCOCK HILL ROAD APPROXIMATELY 2400 FEET DOWNSTREAM OF THE DAM AND IS 4± FEET ABOVE THE CHANNEL BED. THE CULVERT ON BABCOCK HILL ROAD HAS A CLEARENCE OF 6± FEET THUS, THE FLOOD WATER WHICH IS ESTIMATED TO HAVE A DEPTH OF 10.4 FEET AT SECTION AA WITH A VELOCITY OF 9 FPS, COULD INUNDATE SEVERAL OF THESE

BUILDINGS CONTAINING MACHINERY AND EQUIPMENT WITH 4 TO 5 FEET OF WATER AS WELL AS A PORTION OF BABCOCK HILL ROAD.

IN BETWEEN BABCOCK HILL ROAD AND STATE ROUTE 32 SEVERAL HOUSES ARE LOCATED. AT SECTION BB LOCATED 2900 FEET DOWNSTREAM OF THE DAM AND IN BETWEEN THE TWO ROADS, THE FLOOD DEPTH IS ESTIMATED TO BE 6.7 FEET, HAVING A VELOCITY OF 7.5 FPS. IT IS EXPECTED THAT DUE TO DAM BREACH, AT LEAST FOUR OF THESE HOUSES COULD BE INUNDATED WITH 2± FEET OF FLOOD WATER. IN ADDITION, STATE ROUTE 32 WHICH IS A HEAVILY TRAVELED ROAD COULD BE DAMAGED.

THUS, A BREACH OF BIG POND DAM HAS A POTENTIAL FOR LOSS OF SEVERAL LIVES AND LOSS OF PROPERTY AND PUBLIC FACILITIES. THIS SITUATION COULD BE FURTHER AGGRAVATED BY A SIMULTANEOUS FAILURE OF SPENCER POND DAM UPSTREAM OF BIG POND DAM.

THUS, IT CAN BE SEEN FROM THE ABOVE DISCUSSION, A HAZARD POTENTIAL OF HIGH MAGNITUDE IS CONSIDERED LIKELY.

PROJECT NON FEDERAL DAM INSPECTION PROJECT NO. 80-10-14 SHEET 21 OF 21
NEW ENGLAND DIVISION COMPUTED BY mk DATE 6/24/80
BIG POND DAM CHECKED BY Eb DATE 6/25/80

SUMMARY- HYDRAULIC/HYDROLOGIC COMPUTATIONS

TEST FLOOD PEAK INFLOW PMF		3250 CFS
PERFORMANCE AT PEAK FLOOD CONDITIONS:	PMF	½PMF
PEAK INFLOW	3250CFS	1625 CFS
PEAK OUTFLOW	2980CFS	1400 CFS
SPIL. CAP. TO TOP OF DAM (EL.261.6)	512CFS	512 CFS
SPIL. CAP. TO TOP OF DAM % OF TEST FLOOD OUTFLOW	17%	37%
SPIL. CAP. TO TEST FLOOD ELVN.	740CFS	575 CFS
SPIL. CAP. TO TEST FLOOD ELVN. % OF TEST FLOOD OUTFLOW	25%	41%
AUX. SPIL. CAP. TO TOP OF DAM	384CFS	384 CFS
AUX. SPIL. CAP. TO TOP OF DAM% OF TEST FLOOD OUTFLOW	13%	27%
AUX. SPIL. CAP. TO TEST FLOOD ELVN.	657CFS	461 CFS
AUX. SPIL. CAP. TO TEST FLOOD ELVN. %OF TEST FLOOD OUTFLOW	22%	33%
TEST FLOOD-DAM OVERTOPPED:		
MAXIMUM POOL ELEVATION	262.6	261.9
MAXIMUM SURCHARGE HEIGHT ABOVE SPILLWAY CREST	4.6FT	3.9 FT
NON-OVERFLOW SECTION OF THE DAM OVERTOPPED BY	1 FT	0.3 FT
DOWNSTREAM FAILURE CONDITIONS:		
TOTAL PEAK FAILURE OUTFLOW	11,000CFS	
HEIGHT AT TIME OF FAILURE	8.4FT	
CONDITIONS AT INITIAL IMPACT AREA: (CHANNEL BED ELEVN. 200)		
STAGE BEFORE FAILURE WITH 1000CFS	203.5	
STAGE AFTER FAILURE WITH 9,400 CFS	210.4	
RAISE IN STAGE AFTER FAILURE ΔY_1	6.9FT	
CONDITIONS AT SECONDARY IMPACT AREA: (CHANNEL BED ELEVN. 150)		
STAGE BEFORE FAILURE WITH 1000CFS	152.9	
STAGE AFTER FAILURE WITH 8,300 CFS	156.7	
RAISE IN STAGE AFTER FAILURE ΔY_2	3.8FT	

PRELIMINARY GUIDANCE

FOR ESTIMATING

MAXIMUM PROBABLE DISCHARGES

IN

PHASE I DAM SAFETY

INVESTIGATIONS

New England Division
Corps of Engineers

March 1978

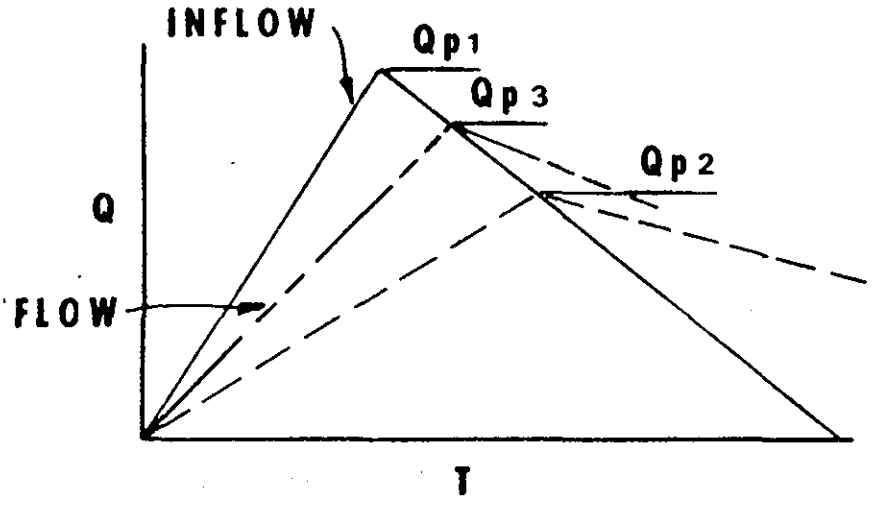
MAXIMUM PROBABLE FLOOD INFLOWS
NED RESERVOIRS

	Project	Q (cfs)	D.A. (sq. mi.)	MPF cfs/sq. mi.
1.	Hall Meadow Brook	26,600	17.2	1,546
2.	East Branch	15,500	9.25	1,675
3.	Thomaston	158,000	97.2	1,625
4.	Northfield Brook	9,000	5.7	1,580
5.	Black Rock	35,000	20.4	1,715
6.	Hancock Brook	20,700	12.0	1,725
7.	Hop Brook	26,400	16.4	1,610
8.	Tully	47,000	50.0	940
9.	Barre Falls	61,000	55.0	1,109
10.	Conant Brook	11,900	7.8	1,525
11.	Knightville	160,000	162.0	987
12.	Littleville	98,000	52.3	1,870
13.	Colebrook River	165,000	118.0	1,400
14.	Mad River	30,000	18.2	1,650
15.	Sucker Brook	6,500	3.43	1,895
16.	Union Village	110,000	126.0	873
17.	North Hartland	199,000	220.0	904
18.	North Springfield	157,000	158.0	994
19.	Ball Mountain	190,000	172.0	1,105
20.	Townshend	228,000	106.0(278 total)	820
21.	Surry Mountain	63,000	100.0	630
22.	Otter Brook	45,000	47.0	957
23.	Birch Hill	88,500	175.0	505
24.	East Brimfield	73,900	67.5	1,095
25.	Westville	38,400	99.5(32 net)	1,200
26.	West Thompson	85,000	173.5(74 net)	1,150
27.	Hodges Village	35,600	31.1	1,145
28.	Buffumville	36,500	26.5	1,377
29.	Mansfield Hollow	125,000	159.0	786
30.	West Hill	26,000	28.0	928
31.	Franklin Falls	210,000	1000.0	210
32.	Blackwater	66,500	128.0	520
33.	Hopkinton	135,000	426.0	316
34.	Everett	68,000	64.0	1,062
35.	MacDowell	36,300	44.0	825

MAXIMUM PROBABLE FLOWS
BASED ON TWICE THE
STANDARD PROJECT FLOOD
(Flat and Coastal Areas)

	River	SPF (cfs)	D.A. (sq. mi.)	MPF (cfs/sq. mi.)
1.	Pawtuxet River	19,000	200	190
2.	Mill River (R.I.)	8,500	34	500
3.	Peters River (R.I.)	3,200	13	490
4.	Kettle Brook	8,000	30	530
5.	Sudbury River.	11,700	86	270
6.	Indian Brook (Hopk.)	1,000	5.9	340
7.	Charles River.	6,000	184	65
8.	Blackstone River.	43,000	416	200
9.	Quinebaug River	55,000	331	330

ESTIMATING EFFECT OF SURCHARGE STORAGE ON MAXIMUM PROBABLE DISCHARGES



STEP 1: Determine Peak Inflow (Qp_1) from Guide Curves.

STEP 2: a. Determine Surcharge Height To Pass "Qp_1".

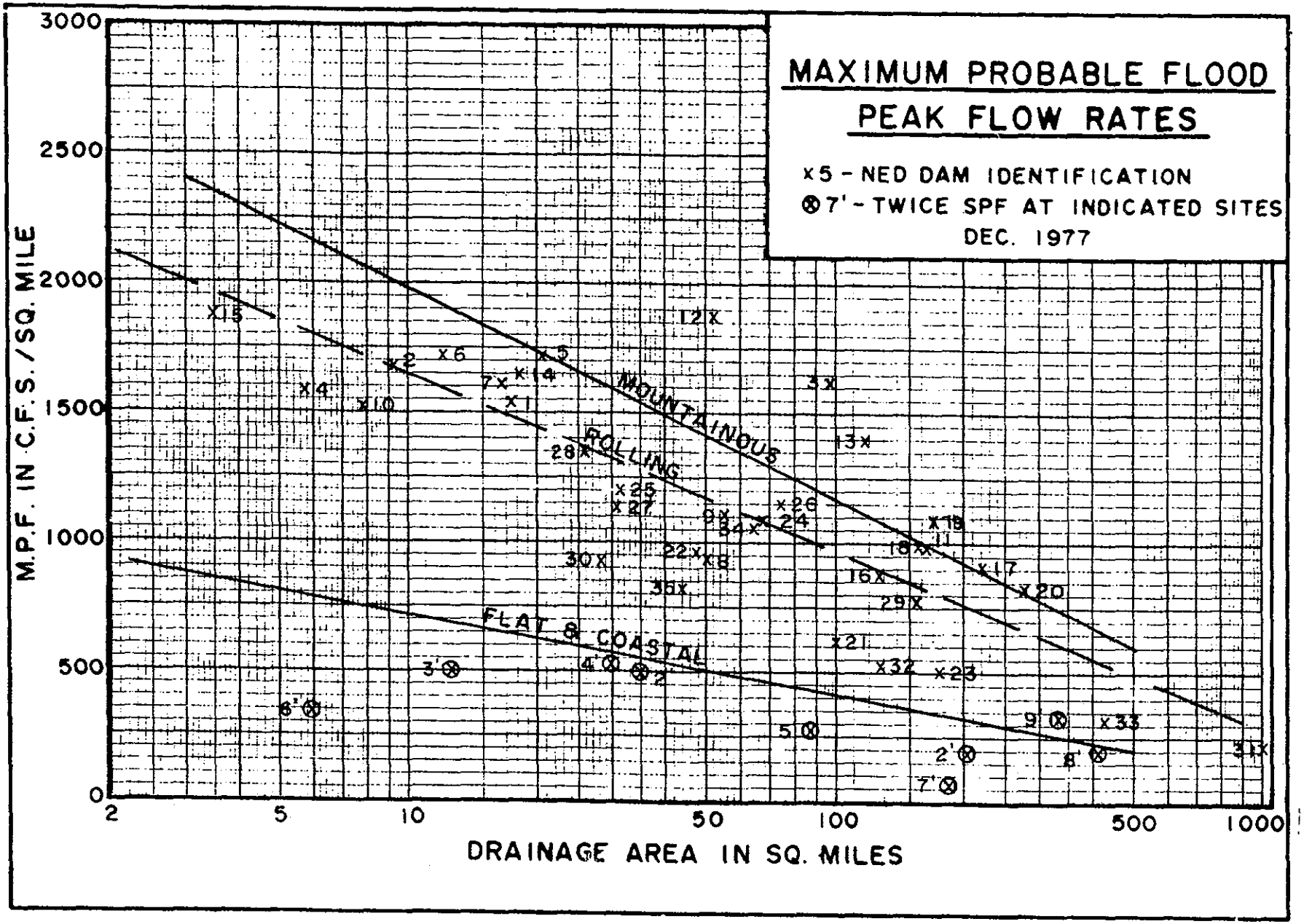
b. Determine Volume of Surcharge ($STOR_1$) In Inches of Runoff.

c. Maximum Probable Flood Runoff In New England equals Approx. 19", Therefore:

$$Qp_2 = Qp_1 \times \left(1 - \frac{STOR_1}{19}\right)$$

STEP 3: a. Determine Surcharge Height and "$STOR_2$" To Pass "Qp_2"

b. Average "$STOR_1$" and "$STOR_2$" and Determine Average Surcharge and Resulting Peak Outflow "Qp_3".


MAXIMUM PROBABLE FLOOD
PEAK FLOW RATES
x5 - NED DAM IDENTIFICATION
⊗7' - TWICE SPF AT INDICATED SITES
DEC. 1977
M.P.F. IN C.F.S./SQ. MILE
DRAINAGE AREA IN SQ. MILES
3000
2500
2000
1500
1000
500
0
2
5
10
50
100
500
1000
MOUNTAINOUS
ROLLING
FLAT & COASTAL
x15
x4
x10
x2
x6
x5
7x
x14
x1
12x
3x
13x
28x
x25
x27
x26
24x
x18
11
18x
x17
x20
16x
29x
30x
22x
x8
36x
x21
x32
x23
x33
31x
3'⊗
4'⊗
2'⊗
6'⊗
5'⊗
9'⊗
2'⊗
8'⊗
7'⊗

SURCHARGE STORAGE ROUTING SUPPLEMENT

STEP 3: a. Determine Surcharge Height and "$STOR_2$" To Pass "Qp_2"

b. Avg "$STOR_1$" and "$STOR_2$" and Compute "Qp_3".

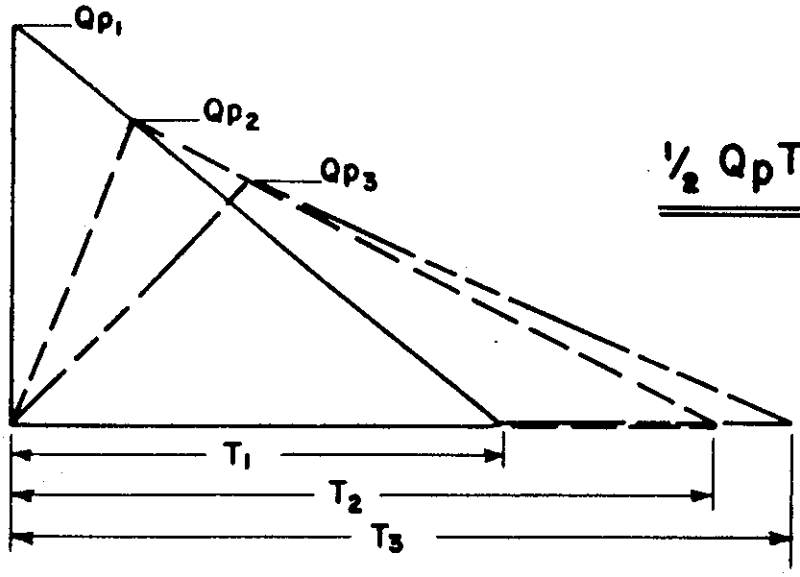
c. If Surcharge Height for Qp_3 and "$STOR_{AVG}$" agree O.K. If Not:

STEP 4: a. Determine Surcharge Height and "$STOR_3$" To Pass "Qp_3"

b. Avg. "Old $STOR_{AVG}$" and "$STOR_3$" and Compute "Qp_4"

c. Surcharge Height for Qp_4 and "New $STOR_{Avg}$" should Agree closely

"RULE OF THUMB" GUIDANCE FOR ESTIMATING DOWNSTREAM DAM FAILURE HYDROGRAPHS



$\frac{1}{2} Q_p T = 12 S$

STEP 1: DETERMINE OR ESTIMATE RESERVOIR STORAGE (S) IN AC-FT AT TIME OF FAILURE.

STEP 2: DETERMINE PEAK FAILURE OUTFLOW (Q_{p1}).

$$Qp_1 = \frac{8}{27} W_b \sqrt{g} Y_o^{\frac{3}{2}}$$

W_b = BREACH WIDTH - SUGGEST VALUE NOT GREATER THAN 40% OF DAM LENGTH ACROSS RIVER AT MID HEIGHT.

Y_o = TOTAL HEIGHT FROM RIVER BED TO POOL LEVEL AT FAILURE.

STEP 3: USING USGS TOPO OR OTHER DATA, DEVELOP REPRESENTATIVE STAGE-DISCHARGE RATING FOR SELECTED DOWNSTREAM RIVER REACH.

STEP 4: ESTIMATE REACH OUTFLOW (Q_{p2}) USING FOLLOWING ITERATION.

A. APPLY Q_{p1} TO STAGE RATING, DETERMINE STAGE AND ACCOPMANYING VOLUME (V_1) IN REACH IN AC-FT. (NOTE: IF V_1 EXCEEDS 1/2 OF S, SELECT SHORTER REACH.)

B. DETERMINE TRIAL Q_{p2}.

$$Qp_2(\text{TRIAL}) = Qp_1 \left(1 - \frac{V_1}{S}\right)$$

C. COMPUTE V_2 USING Q_{p2} (TRIAL).

D. AVERAGE V_1 AND V_2 AND COMPUTE Q_{p2}.

$$Qp_2 = Qp_1 \left(1 - \frac{V_{AVG}}{S}\right)$$

STEP 5: FOR SUCCEEDING REACHES REPEAT STEPS 3 AND 4.

APRIL 1978

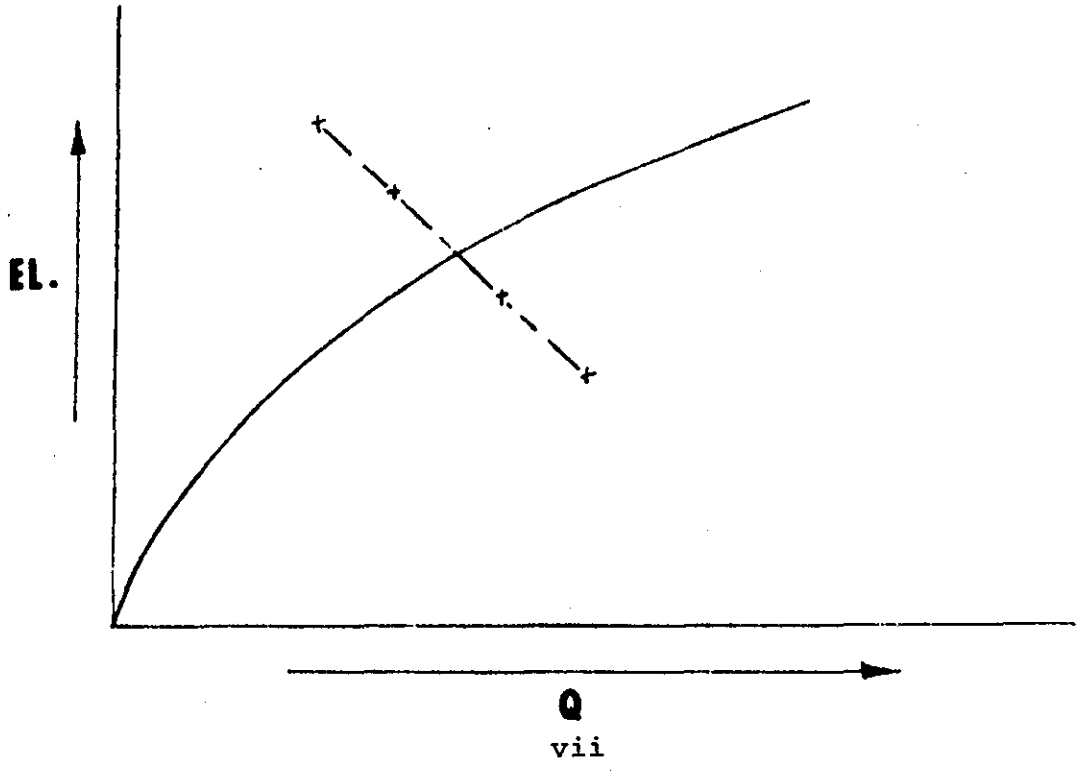
SURCHARGE STORAGE ROUTING ALTERNATE

$$Q_{p2} = Q_{p1} \times \left(1 - \frac{STOR}{19}\right)$$

$$Q_{p2} = Q_{p1} - Q_{p1}\left(\frac{STOR}{19}\right)$$

FOR KNOWN Q_{p1} AND 19'' R.O.

Q_{p2}	STOR	EL.



APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

DISPOSITION FORM

For use of this form, see AR 340-15; the proponent agency is The Adjutant General's Office.

REFERENCE OR OFFICE SYMBOL	SUBJECT
NEDED-E	Dam Inspection Final Report

TO	FROM	DATE	CMT 1
Chief, Design Branch Chief, Geotechnical Engineering Branch Chief, Water Control Branch	Chairman, Dam Safety Review Board	29 Sept. 1980	

1. Attached is a single copy of the final report for

BIG POND DAM Dam, Identity No. CT00194.

2. Please ascertain that the report is acceptable in accordance with your Branch comments or instructions given to the Architect-Engineer at the Review Board Meeting.

3. If the report requires further work or correction, notify the Project Management Branch as soon as the determination is made.

4. The review period for this report expires on 14 October 1980

5. The cost code for this review is ABA0 1070I 00000 (FY80)

D. Buono

DIBUONO

Recommend Acceptance after incorporation of comment that "Mention should be made that the owner does not have anyone at the site" is Section 1.2f on page 1-3.

10/29/80

JSB for RJD

Not critical from tech stand point ~~not~~

DA FORM 2496 REPLACES DD FORM 96, EXISTING SUPPLIES OF

DISPOSITION FORM

For use of this form, see AR 340-15; the proponent agency is The Adjutant General's Office.

REFERENCE OR OFFICE SYMBOL	SUBJECT
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5. The cost code for this review is ABA0 10701 00000 (FY80)

D. Buono

DIBUONO

O.K. JAC

1434

DA FORM 2496 REPLACES DD FORM 96, EXISTING SUPPLIES OF WHICH ARE

DISPOSITION FORM

For use of this form, see AR 340-15; the proponent agency is The Adjutant General's Office.

REFERENCE OR OFFICE SYMBOL	SUBJECT
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D. Buono

DIBUONO

O.K. JAC

16 24

DA FORM 2496 REPLACES DD FORM 88, EXISTING SUPPLIES OF WHICH MAY BE

DISPOSITION FORM

For use of this form, see AR 340-15; the proponent agency is The Adjutant General's Office.

REFERENCE OR OFFICE SYMBOL	SUBJECT
NEDED-E	Dam Inspection Final Report

TO	FROM	DATE	CMT 1
Chief, Design Branch Chief, Geotechnical Engineering Branch Chief, Water Control Branch	Chairman, Dam Safety Review Board	29 Sept. 1980	

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D. Buono

DIBUONO

O.K. JJC

16?

DA FORM 2496 REPLACES DD FORM 88, EXISTING SUPPLIES OF WHICH MAY BE

DETERMINATION OF LETTER TYPE

CT 194 Name: Big Pond Dam

Hazard(a) High Condition Poor

Height 19 Length 530 Top Width 10

Max Storage (top of dam) 300 AF

Test Flood 1/2 PMF

½ PMF Overtopping(c) 3.9

Spillway Capacity 15% PMF

Increased D/S Hazard(b) YES

Duration of Overtopping UNK

Type of Dam EARTH EMBANKMENT WITH U/S CONCRETE RETAINING WALL

History of Overtopping UNKNOWN

Major Problems EXCESSIVE Seepage through embankment poor condition of U/S concrete wall possible stability problems in future

Recommened Letter Type: STANDARD (INSUFFICENT SPILLWAY 4/15) SPECIAL

Remarks Seepage investigated upon receipt of report

This Phase I Inspection Report on BIG POND DAM (CT-00194) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

RICHARD DIBUONO, CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

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Engineering Division

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Design Branch
Engineering Division

RICHARD DIBUONO, CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

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Chief, Engineering Division

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Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

RICHARD DIBUONO, CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEDED-E

DEC 9 1980

Mr. Stanley J. Pac, Commissioner
Department of Environmental Protection
State of Connecticut
Hartford, Connecticut 06115

Dear Commissioner Pac:

Forwarded herewith for your information and use is a copy of the Phase I Inspection Report on Big Pond Dam (CT-00194). This inspection was performed in accordance with Public Law 92-367 under the direction of the Corps of Engineers.

The preliminary hydrological analysis contained in Appendix D of this report indicates that the spillway capacity for this dam is insufficient to discharge fifty percent of the Probable Maximum Flood. A storm that would cause a flood of this magnitude could possibly cause overtopping and possible failure of the dam. As a result the dam is adjudged as having a seriously inadequate spillway and is assessed as unsafe non-emergency.

The Governor and the owner have each been forwarded a copy of the report and their attention has been called to the problem concerning the adequacy of the spillway.

We thank you for your cooperation and assistance in carrying out this program and hope this report will help you to develop an effective dam safety program.

Sincerely,

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

Incl
As stated

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEDED-E

DEC 9 1980

Honorable Ella T. Grasso
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor Grasso:

Inclosed is a copy of the Big Pond Dam (CT-00194) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. The report is based upon a visual inspection, a review of past performance, and a preliminary hydrological analysis. A brief assessment is included at the beginning of the report.

The preliminary hydrologic analysis has indicated that the spillway capacity for the Big Pond Dam would likely be exceeded by floods greater than 15 percent of the Probable Maximum Flood (PMF), the test flood for spillway adequacy. Our screening criteria specifies that a dam of this class which does not have sufficient spillway capacity to discharge fifty percent of the PMF, should be adjudged as having a seriously inadequate spillway and the dam assessed as unsafe, non-emergency, until more detailed studies prove otherwise or corrective measures are completed.

The term "unsafe" applied to a dam because of an inadequate spillway does not indicate the same degree of emergency as that term would if applied because of structural deficiency. It does indicate, however, that a severe storm may cause overtopping and possible failure of the dam, with significant damage and potential loss of life downstream.

It is recommended that within twelve months from the date of this report the owner of the dam engage the services of a professional or consulting engineer to determine by more sophisticated methods and procedures the magnitude of the spillway deficiency. Based on this determination, appropriate remedial mitigating measures should be designed and completed within 24 months of this date of notification. In the interim a detailed emergency operation plan and warning system should be promptly developed. During periods of unusually heavy precipitation, round-the-clock surveillance should be provided.

DEC 9 1980

NEDED-E
Honorable Ella T. Grasso

I have approved the report and support the findings and recommendations described in Section 7, with qualifications as noted above. I request that you keep me informed of the actions taken to implement these recommendations since this follow-up is an important part of the non-Federal Dam Inspection Program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. This report has also been furnished to the owner of the project, H.L. Diehl Corporation, South Windham, Conn.

Copies of this report will be made available to the public, upon request to this office, under the Freedom of Information Act, thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for the cooperation extended in carrying out this program.

Sincerely,

WILLIAM E. HODGSON, JR.
Colonel, Corps of Engineers
Acting Division Engineer